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HOLES CREEK, WATER RESOURCES DEVELOPMENT. VOLUME 2. APPENDICES.(U)

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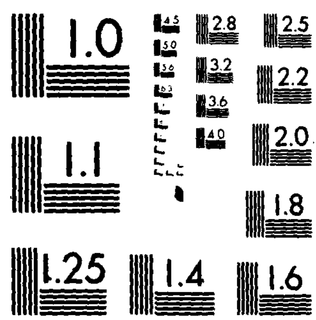

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HOLES CREEK

APPENDICES FOR INTERIM REPORT NO. 2

FOR WATER RESOURCES DEVELOPMENT

SOUTHWEST, OHIO

APPENDIX A	PROBLEM IDENTIFICATION
APPENDIX B	FORMULATION, ASSESSMENT AND EVALUATION OF DETAILED PLANS
APPENDIX C	PUBLIC VIEWS AND RESPONSES
APPENDIX D	HYDROLOGY AND HYDRAULICS
APPENDIX E	ECONOMICS
APPENDIX F	SECTION 404 EVALUATION

MIAMI TWP · MORAINE

WEST CARROLLTON · MONTGOMERY CO., OHIO

APPENDIX A

PROBLEM IDENTIFICATION

APPENDIX A

PROBLEM IDENTIFICATION

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

TABLES

Table of Contents (Continued)

FIGURES

Table of Contents (Continued)

PLATES

ADDENDA

Appendix A
Problem Identification

Introduction

The purpose of this appendix is to present background information relating to the study and to present information pertaining to planning constraints, planning objectives, and specific data on projections and analyses to the extent necessary to identify the water resource problems and opportunities.

Study Authority

The authority for this study is contained in two resolutions, namely the U.S. SENATE RESOLUTION of 31 May 1967 and the U.S. HOUSE OF REPRESENTATIVES RESOLUTION OF 19 October 1967. The resolutions read as follows:

RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Board of Engineers for Rivers and Harbors, created under Section 3 of the Rivers and Harbors Act, approved June 13, 1902, be, and is hereby requested to review the report of the Chief of Engineers on the Comprehensive Flood Control Plan for the Ohio and Lower Mississippi Rivers, published as Flood Control Committee Document Numbered 1, Seventy-fifth Congress, and other pertinent reports, with a view to determining whether any modifications of the recommendations contained therein are advisable at the present time, with particular reference to consideration of improvements for flood control, water quality control, water supply, recreation, fish and wildlife, and other purposes, in a plan for development of the water resources in the Miami River, Little Miami River, and Mill Creek Basins in Southwestern Ohio.

RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE HOUSE OF REPRESENTATIVES, UNITED STATES, That the Board of Engineers for Rivers and Harbors is hereby requested to review the reports of the Chief of Engineers on the Comprehensive Flood Control Plan for the Ohio and Lower Mississippi Rivers, published as Flood Control Committee Document Numbered 1, Seventy-fifth Congress, and other pertinent reports, with a view to determining whether any modifications of the recommendations contained therein are advisable at the present time, with particular reference to consideration of improvements for flood control, water quality control, water supply, recreation, fish and wildlife, and other purposes, in a plan for development of the water resources in the Miami River, Little Miami River, and Mill Creek Basins in Southwestern Ohio.

Scope of the Study

The authorizing resolutions directed the study to encompass the Miami River, Little Miami River, and Mill Creek Basins in Southwestern Ohio. Such a study includes consideration of water resources in the vicinity of West Carrollton, Ohio--Holes Creek and Owl Creek. This report pertains only to this latter area. A later report will address the remainder of the authorized study area. This report discusses in detail the present and projected water related problems and needs at West Carrollton and considers alternatives for appropriate solutions, and presents a plan of improvement determined to be the best available. The study includes field investigations, hydrologic investigations, economic studies, and coordination with Federal, State, and local governmental units. These studies were made in depth and detail deemed sufficient to permit the comparison of alternative plans, and the selection of the most suitable plan.

Study Participants and Coordination

Comments and inputs were requested from agencies having primary responsibility for information in specific areas. Coordination was maintained with the City of West Carrollton, the Miami Conservancy District (MCD), the U.S. Fish and Wildlife Service, and the State of Ohio.

An early public meeting held in the Dayton area was one of three initial meetings for the parent study. Although no initial public meeting was held for this interim study, meetings with representatives of MCD, Ohio, West Carrollton, and other local entities were held in June 1975, November 1977, and September 1978. Their concerns and views have been incorporated into the study. Appropriate letters from the above participants and the preliminary and draft reports from the U.S. Fish and Wildlife Service are included as exhibits in Appendix C.

The Formulation Stage Public Meeting was held at West Carrollton on 14 December 1978. Of the 65 to 70 persons in attendance, five to six local property owners objected to any type of flood control improvements and a similar number supported the study. Local officials, represented primarily by the Miami Conservancy District (MCD), supported the study and indicated their preference for a channel improvement alternative at Holes Creek.

The final public meeting was held in West Carrollton on 24 June 1980. Approximately 100 persons attended the meeting. Comments received varied from objections to any type of improvement to full support of the selected plan. Local officials, consisting of representatives from the Miami Conservancy District, City of West Carrollton, Miami Township, and Montgomery County, expressed agreement that flood control improvements were needed and that the selected plan appeared to be the best plan. A petition was received at the meeting which had seventy names, of which 53 stated they were against flood control improvements on Holes Creek.

Studies by Others

The only prior study pertaining to flood problems in the study area was a brief reconnaissance report prepared by the Miami Conservancy District in 1961. The report considered channel improvement plans for Holes Creek and Owl Creek and tributaries, and levee plans along Holes Creek and at Allen Plat. From this study, channel improvements were accomplished for a portion of Owl Creek and one tributary. Flood control studies and projects for the Miami River Basin are many, but their relation to this study is minor and, as such, they are not included here. However, a study by the Miami Conservancy District did result in a local protection project at West Carrollton for reduction of flood damages from the Miami River.

Several recent related studies have been completed that include the study area. These studies are generally for county-wide or larger areal coverage. They include studies on water supply, water quality, land use, demographic topics, soils, and developmental aspects. A partial listing of the agencies preparing these reports would include: U.S. Environmental Protection Agency; U.S. Department of Agriculture; State of Ohio; and the Miami Valley Regional Planning Commission. Also, a Flood Insurance Study is underway for the City of West Carrollton by the Office of Federal Insurance and Hazard Mitigation.

Report Process

The completion of this report will finish the preauthorization studies for the area. The main report, EIS, and these appendices provide the documentation for further review and action by Federal and State decision makers. More specifically, the report will be transmitted to and reviewed by the following: Corps of Engineers--Ohio River Division, Board of Engineers for Rivers and Harbors, and Chief of Engineers; Secretary of the Army; Office of Management and Budget; and Congress. The above process includes additional steps to obtain further inputs from the general public and local, State, and

Federal agencies. Upon completing this review, the Division Engineer will issue a public notice to all persons known to be interested in the study. The notice sets forth the findings of the study and invites those, who wish to do so, to furnish their views and comments to the Board of Engineers for Rivers and Harbors. Depending upon the views and comments received and upon controversial matters, the Board may hold a public meeting during its review of the report. The Chief of Engineers forwards copies of the report to the Governor of Ohio and to other interested Federal agencies for formal review and comments. After receipt and consideration of all comments including the review by the Office of Management and Budget, the Secretary of the Army transmits the report to Congress for action.

The above-described review process generally takes 1 year or more for completion. Congress would then act on the report. Assuming a project is authorized, Congress would then appropriate funds for advanced engineering and design, and construction. The total process from completion of this report to a theoretical completion of construction, under favorable conditions, would take about 5 years, or until about 1985.

National Objectives

The formulation of plans is directed to meeting current and projected problems and needs so that improved contributions are made for National Economic Development and Environmental Quality. The general objectives for formulating plans are those presented in Senate Document No. 97, 87th Congress, the National Environmental Policy Act of 1969, Section 122 of the Rivers and Harbors Act of 1970, and other pertinent laws.

Existing Condition

Natural Resources and Main Features

The study area is located in the south-central part of Montgomery County, with two small areas in the upper reaches of Holes Creek extending southward into Warren County. The drainage areas of the two streams cover 32.6 square miles. Holes Creek drains 28.2 square miles and Owl Creek drains 4.4 square miles. Both streams are tributaries of the Miami River. Holes Creek has its confluence with the Miami at Mile 72.65 and Owl Creek enters the Miami downstream from Holes Creek at Mile 68.7. The Miami River flows from north to south toward the Ohio River.

The flood plain of the study area is highly urbanized with relatively small open space and greenbelt strips along the two creeks. In pursuit of open land for housing, industry and commercial activity, developers have utilized much of the suitable land. In order to control urban growth concentration, the Miami Valley Regional Planning Commission, and planning commissions of surrounding communities, have made land use plans which allocate areas of future urban growth and areas in which intensive land development would be discouraged. These plans also prescribe open space criteria which could maintain sufficient open areas for recreation.

TOPOGRAPHY

Topography of the stream basins is characterized by the flat, alluvial plain terraces of the Miami River and the dissected plateaus of the uplands. Elevation levels in the Owl Creek Basin range from 690 feet (National Geodetic Vertical Datum) at the streamsides of Owl Creek-Miami River confluence to 1,025 feet (NGVD) along Interstate Highway 75 in the south. Elevation levels in the Holes Creek Basin range from 710 feet (NGVD) at the streamsides of Holes Creek-Miami River confluence to 1,052 feet (NGVD) east of Interstate Highway 75. Most of the relief in the flood plain is accounted for by the abrupt descent from the uplands onto the Miami River flood plain.

Originally the area was a broad, nearly level to gently rolling till plain. A grinding down and filling in effect by glacial activity, resulting in stream development, altered the original till plain into a gently rolling to moderately steep limestone topography, except for relatively rough terrain along stream bluffs.

CLIMATE

The climate of the study area is continental which is marked by large annual and daily changes in temperatures. Such a climate is characteristic of the eastern interior of the United States. Due to the location of Holes Creek-Owl Creek Basins along the Ohio River Valley, which is a major path for high and low atmospheric pressure systems, the climate is quite variable. Summers are warm and moderately humid and there is an average of 25 days when temperatures are 90°F, or higher. Winters are cold and cloudy and normally there are up to 4 days of subzero temperatures. Valley locations generally have freezes later in the spring and earlier in the fall than do rolling areas on hilltops because cool air drains down the slopes into the valleys on nights of clear skies and calm or light winds. During January, the coldest month, the average temperature is 28.1°F, and in July, the warmest month, the average temperature is 74.6°F. Precipitation in the study area varies widely from year to year which is typical of a continental climate, but it is normally abundant and well distributed throughout the year. The least amount of precipitation occurs during the fall. Thunderstorms with high intensities of rainfall are common during the spring and the summer. During the winter, rain is the most frequent form of precipitation. Average annual precipitation in nearby Dayton is 38 inches.

SOILS

There are seven soil associations represented in the drainage basins. The Ross-Medway Association is the principal soil in the Miami River flood plain. The Fox-Ockley Association is predominant within the corporate limits

of West Carrollton, including the lower reaches of Holes Creek. The Ross-Medway Association is primarily the association of the Miami River itself and the lower reaches of its tributaries. The middle reaches of Holes Creek and the upper reaches of Owl Creek are predominated by the Miamian-Celina Association. The Xenia-Russel Association predominates around the upper reaches of Holes Creek. The Milton-Ritchey-Hillsdale Association exists southwest of West Carrollton near the mouth of Owl Creek and near the middle course of Holes Creek. The Brookston-Fincastle Association and the Brookston-Crosby Association exist in the upper reaches of Holes Creek. At least a portion of the nursery lands between Springboro Pike and Lamme Road is classified as prime farmland by U.S.D.A. Figure A-1 shows the extent and location of the various soils. These soils, as described in the Soil Survey of the Soil Conservation Service with minor modifications, are as follows.

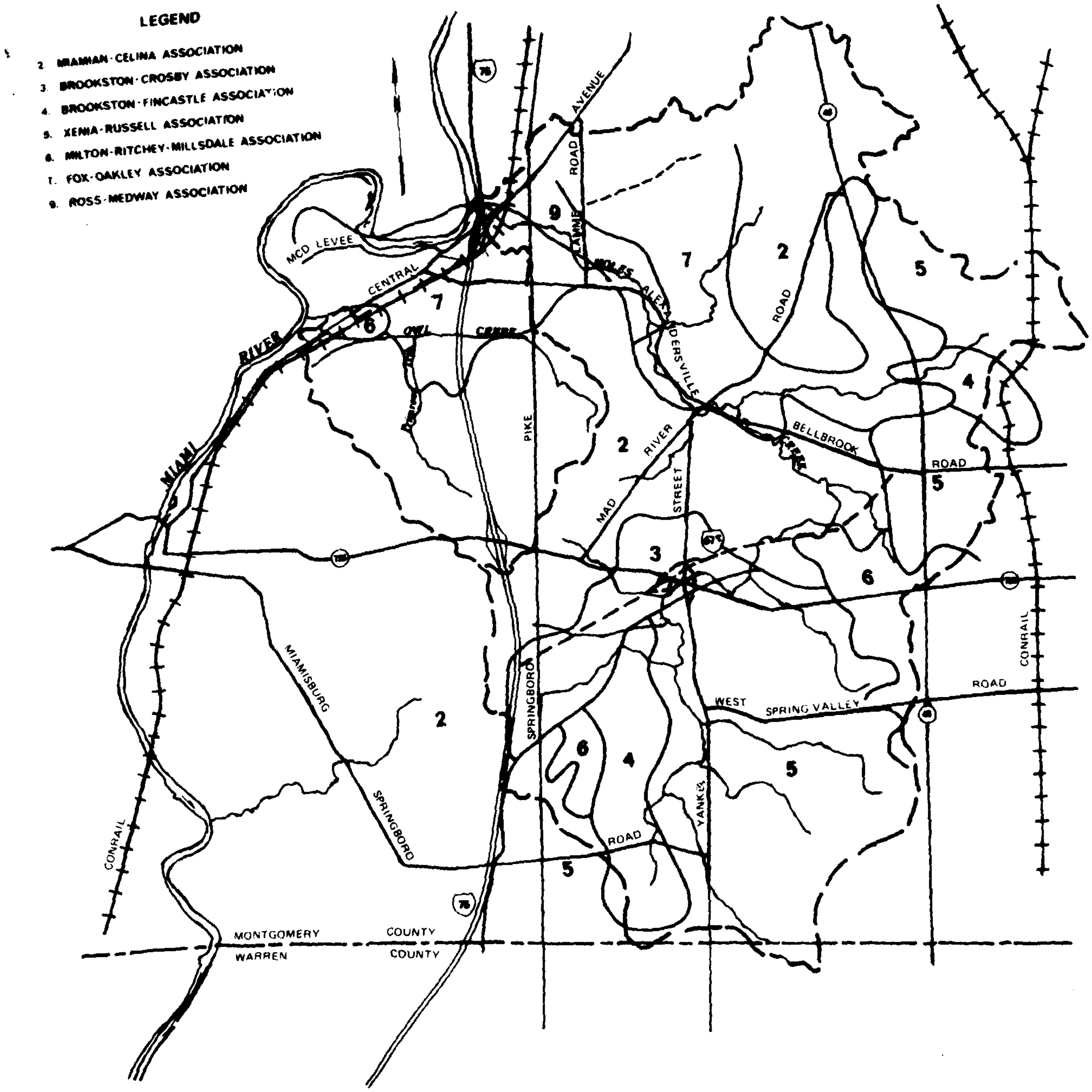


FIGURE A–1: GENERAL SOILS

Fox-Ockley Association - Deep, nearly level to moderately steep, well-drained soils that have a moderately fine textured subsoil. The association is formed in loess and loamy outwash underlain by calcareous and gravel deposits.

Permeability	0.6 to 2.0 Inches/Hour
Seasonal Water Table	3+ Feet
Slope	0 to 2 Percent
Depth to Bedrock	5+ Feet
Erosion Hazard	Little or none

Ross-Medway Association - Deep, nearly level, well-drained and moderately well-drained soils that have a dominant moderately coarse textured and medium textured subsoil or underlying material. This association is formed in loamy alluvium.

Peameability	0.6 to 2.0 Inches/Hour
Seasonal Water Table	1-1/2 to 3 Feet
Slope	Nearly level
Depth to Bedrock	5+ Feet
Erosion Hazard	None

Miamian-Celina Association - Deep, mainly gently rolling to moderately steep, well-drained and moderately well-drained soils that have a moderately fine textured and fine textured subsoil. This association is formed in thin loess and glacial till.

Permeability	0.2 to 2.0 Inches/Hour
Seasonal Water Table	1-1/2 to 3+ Feet
Slope	2 Percent to Steep
Depth to Bedrock	5+ Feet
Erosion Hazard	Slight to Moderate

Xenia-Russel Association - Deep, mainly nearly level to gently sloping, moderately well-drained and well-drained soils that have a moderately fine textured subsoil. This association is formed in thick loess and glacial till.

Permeability	0.6 to 2.0 Inches/Hour
Seasonal Water Table	1-1/2 to 3+ Feet
Slope	2 to 6 Percent
Depth to Bedrock	5+ Feet
Erosion Hazard	Slight to Moderate

Milton-Ritchey-Hillsdale Association - Moderately deep to shallow, nearly level to very steep, well-drained and very poorly drained soils that have a moderately fine textured and fine textured subsoil. This association is formed in glacial till over limestone.

Permeability	0.6 to 2.0 Inches/Hour
Seasonal Water Table	3+ Feet
Slope	Rolling
Depth to Bedrock	1 to 3-1/2 Feet
Erosion Hazard	Slight to Moderate

Brookston-Fincastle Association - Deep, mainly nearly level to gently sloping, very poorly drained and somewhat poorly drained soils that have a moderately fine textured subsoil. This association is formed in thick loess and glacial till.

Permeability	0.6 to 2.0 Inches/Hour
Seasonal Water Table	0 to 1-1/2 Feet
Slope	0 to 4 Percent
Depth to Bedrock	5+ Feet
Erosion Hazard	Slight

Brookston-Crosby Association - Deep, mainly nearly level to gently sloping, very poorly drained and somewhat poorly drained soils that have a moderately fine textured subsoil. This association is formed in thick loess and glacial till.

Permeability	0.6 to 2.0 Inches/Hour
Seasonal Water Table	0 to 1-1/2 Feet
Slope	0 to 4 Percent
Depth to Bedrock	5+ Feet
Erosion Hazard	None

GEOLOGY

The geological formations in Montgomery County originated from bedrock, glacial drift, and loess. At first, a thick mantle of gravel, clay, boulders, and stones was left by superstrata of the glacial era. Then windblown loess was deposited in the post-glacial era.

The underlying bedrock belongs to two different groups. The bedrock which predominates in the study area is that of the Clinton-Maysville-Richmond group of the Ordovician System. This bedrock is composed of shale and limestone which yields little or no water due to lack of porosity. The other bedrock which is found mainly in parts of northern Montgomery County is that of the Niagara Group of the Silurian System. This bedrock is composed mainly of limestone and dolomite which is generally porous and a good source of ground water. Glacial activity also formed the outwash which exists in the forms of kames composed of gravel, sand, and clay on the terraces of the Miami River. The thickness of the outwash ranges from thin lenses to 180 feet in parts of south Dayton.

A particularly significant result of glacial activity is that glacially deposited sand and gravel within an urban area serves two significant economic functions at a low cost. Sand and gravel deposits are a source of

construction material and their presence near rivers and creeks constitutes a potentially good source of ground water. Gravel, sand, clay, and limestone are the only minerals commercially extracted in the region. Table A-1 presents additional data on the geology of the area.

SURFACE AND GROUND WATER

Surface water exhibits a major difference in quality between the two streams. The water of lower Owl Creek appears to be polluted as a result of industrial waste disposal and does not support a habitat for fauna of any significance. The water of Holes Creek is clear in the upper reaches and moderately clear in the lower reaches and is supportive of a habitat for typical fauna. Although a basic hydraulic relationship exists between surface water and ground water in terms of quantity and often quality, almost all consumption of water in the area depends on withdrawal of subsurface water by pumpage. In both quantity and quality, ground water in the area is more easily managed than surface water for urban consumption. The sources of ground water are precipitation, infiltration from nearby streams, and slow seepage from bedrock. Fortunately, existing and foreseeable demand for ground water is matched by an ample supply, although there is some concern regarding a general lowering of the water table over the past few years due to droughts and increased usage. Currently, Montgomery County maintains a ground water recharge in Moraine near the study area. However, impervious soils in the area prevent extensive ground water recharge. In the vicinity of West Carrollton, 1,284 acres have a ground water potential of 500 or more gallons per minute (g.p.m.). There is no indication at present that ground water is immediately threatened with serious contamination. However, precautionary plans have been proposed to prevent contaminants from invading this valuable natural resource. The Miami Valley Regional Planning Commission has proposed the monitoring of ground water sources at least four times a year with 50 percent of the monitoring to take place during or immediately after runoff periods and 50 percent to take place during dry low flow periods, that all septic tank areas, landfill sites, land application sites for wastewater,

sludge, and septic be inventoried so that potential pollution sources be determined and corrected or eliminated. Further, a study made by the U.S. Geological Survey has concluded that, since contaminants invade ground water from induced stream recharge, ground water receiving recharge by induced stream infiltration be checked periodically so that corrective measures can be taken before contamination becomes a serious problem.

TABLE A-1

STRATIGRAPHIC SEQUENCE OF GEOLOGICAL FORMATIONS IN MONTGOMERY COUNTY, OHIO

System	Group	Formation	Character of Bedrock	Average Thickness (Feet)	Water Bearing Property
		Cedarville	Dolomite, massive, porous	50-100	Generally good water bearing except osgood shale. Wells ordinarily yield from 6 to 15 g.p.m. A few wells yield from 100 to 200 g.p.m. Water is very hard. Spring horizon in base of system.
		Springfield	Dolomite, well-bedded, dense	12-16	
Silurian	Niagara	Euphemia	Dolomite, massive, porous	6-10	
		Laurel	Shale, calcareous	2-8	
		Osgood	Dolomite, dense	5-30	
		Massie	Dolomite, dense	5-6	
		Dayton	Limestone or dolomite, well-bedded, dense, fossilferous	4-9	
		Brassfield	Limestone, massive to irregularly bedded	20-30	Well generally yield no water or seldom more than 1 g.p.m. Water is sometimes highly charged with iron or salt compound. Where water is present, it generally occurs in top few feet of strata.
	Clinton	Elkhorn	Shale, sandy lense	6-20	
Ordovician	Richmond	Richmond	Shale and limestone, soft, calcareous	250-300	
	Maysville	Maysville	Shale, soft, calcareous, interbedded with thin layers of limestone	10-50	

There are several well fields in communities surrounding the flood plain. Three well fields exist in West Carrollton; Moraine has two well fields; and one well field exists in Miamisburg. Water quality of these wells is "quite sketchy" according to the Miami Valley Regional Planning Commission. This is due to the fact that pollution related parameters such as coliform count, oil and grease, pesticides, and biological oxygen demand (BOD) are not monitored. On the basis of one sample from each well field, the following data were found.

WELL FIELD WATER QUALITY

Well Field	Problem Parameter	Desired Levels 1/	Magnitude	Date of Sample
Moraine (Miami Shore)	Alkalinity	(20 to 400)	324	Jan 76
	Iron	(0.3)	0.04	
	Manganese	(0.5)		
Moraine (Lamme Road)	Alkalinity		0.19	Jan 76
West Carrollton				
Well No. 1	Alkalinity		336	Oct 75
	Manganese		0.06	
Well No. 2	Alkalinity		313	
	Manganese		0.07	
Well No. 3	Alkalinity		317	Oct 75
	Iron		1.6	
Miamisburg	Alkalinity		286	Dec 75
	Iron		1.5	

1/ U.S. Public Health Service.

RECREATION

The recreation situation in the immediate study area is characterized by sparse and limited facilities on land and severely limited water oriented outlets. Available data indicate that the recreation situation in the surrounding counties, within one-half hour drive, is not substantially better.

In fact, the entire 12 southwestern counties of Ohio have recreational open space far below the national average, in terms of acres available per 1,000 persons, and much less than the averages of Scioto Valley and Lakeshore Uplands in Ohio, which are also far below the national average. Consequently, residents of the study area may have to travel distances at least beyond 1 hour's drive for recreational opportunities.

The socioeconomic impact of a recreational situation as such tends to be typically as follows. People whose disposable income does not permit driving substantial distances for recreational opportunity would use the nearest available public recreational outlets, perhaps beyond capacity. Meanwhile, some higher income people have to look for recreational opportunity beyond 1 hour's driving time. This has adverse impacts on both energy consumption and local economy, especially as income earned in the local area is spent for recreation in a distant area. Also, as local public recreational facilities prove to be crowded or inadequate, certain higher income groups would either cater to private commercial facilities at a cost usually beyond the reach of lower income groups or establish their own facilities in groups around the plant or the club.

Even though the study area is potentially limited in terms of water related activity, its potential for recreational opportunity on land is unlimited within one-half hour's drive. Park districts and planning agencies in the general area have established aggressive criteria, timetables, and some financial resources to expand and develop recreational facilities gradually toward maintaining a satisfactory recreational situation.

ENVIRONMENTAL AND CULTURAL RESOURCES ASSESSMENT

In the lower reaches, Holes Creek flows through a combination of residential development, commercial development, and idle land. In the reach from Lamme Road to Springboro Pike, the creek is bordered on the right by residential development and on the left by a nursery. From Springboro Pike to Dixie

Drive, the flood plain bordering the right bank is primarily covered by an old field vegetational community, except for commercial development along Springboro Pike. The left bank is bounded by a woodlot of about 4 acres and some residential and commercial property. Projections of future growth in the area indicate that the remaining undeveloped flood plain land will likely be replaced by urban development where flood plain zoning laws can be satisfied.

Holes Creek flows over a streambed composed primarily of gravel and sand with a number of gravel bars present. Just upstream of the Conrail Railroad Bridge, a sewerline crossing has been covered with poured concrete to protect it from erosion and damage. This structure acts as a low head dam that raises the water level about 3 feet and forms a shallow pool extending to Springboro Pike.

The water quality of Holes Creek appears to be reasonably good based on the type of aquatic life supported by the stream. Benthic organisms observed during a site inspection in August 1978 included mayfly larvae, blackfly larvae, damselfly nymphs, aquatic beetles, isopods, and snails. However, benthic fauna were not abundant. Crayfish were present. Fishes which occur in the stream include green sunfish, creek chub, darters, and stone rollers and various other minnows. Bass, bluegills, and catfish were reported to be present in some of the upstream pools.

A typical assemblage of riparian tree species grows along the banks of the creek. The left bank of the stream downstream from Springboro Pike for about 1,000 feet, in particular, has a good tree canopy. The old field communities contain scattered trees and support grasses and weeds such as cocklebur, smartweed, ragweed, sunflower, and black-eyed Susan. The wooded tract supports flood plain tree species. Trees observed along Holes Creek include cottonwood, sycamore, silver maple, box elder, hackberry, black willow, mulberry, black locust, honey locust, green ash, elm, tree-of-heaven, and buckeye. Grape, Virginia creeper, and poison ivy were present in the understory. A shrub which is very common in the area was presumptively identified as amur honeysuckle.

Mammals, which presumptively would inhabit the study area, include squirrels, raccoons, muskrats, cottontail rabbits, rats, and mice. Various reptiles and amphibians and a number of bird species occur in the area.

The portion of Owl Creek below Alexandersville Road and the lower reach of Primrose Tributary have previously been channelized. The streambed is primarily gravel and sand. Water quality on lower Owl Creek appears to be seriously degraded from the point of effluent discharge at a paper company to the mouth of the creek. The discharge is a milky white and leaves a deposit in the streambed. No life forms were visible in the affected portion of the creek. Above the discharge point, the flow was light to nonexistent. In the upper portion of the Primrose Lane Tributary, surface flow was present. This surface flow sinks into the ground farther downstream. No fish were observed in the creek, probably due to the intermittent nature of the water flow. Few invertebrates were observed.

Most of the length of the creek in the considered area passes through residential and industrial areas. Woods and old field areas border the stream in a few places. Riparian vegetation occurs along the streambanks except where streets and yards intervene. Most of the same tree species were observed as were seen at Holes Creek along with sugar maple, black walnut, black cherry, catalpa, and basswood. Animal species similar to those at Holes Creek would occur with the probable exception of muskrat. For further discussion of the flora and fauna of the area, see the Fish and Wildlife Service Reports in Appendix C.

A review of the archaeological site files maintained by the Laboratory of Anthropology, Wright State University, Dayton, Ohio, indicated that a total of six prehistoric or historic archaeological sites have been recorded in the lower reaches of the two creeks. Two of these sites lie in the lower Owl Creek area. The westernmost site, the Perry Pease Mill and Distillery Site (33MY301), a 19th Century historic site, is presumably completely destroyed. The easternmost site (33MY13), the Alexandersville Earthworks, consists of a now completely leveled Woodland Period inclosure which originally covered approximately 31 acres. This site is located immediately northeast of the intersection of Gibbons Road and Primrose Lane.

Four archaeological sites have been recorded in the vicinity of lower Holes Creek, of which three are located on the grounds of the Siebenthaler Nursery. Sites 33MY151, archaic and/or woodland habitation, and 33MY152, a habitation site of undetermined cultural affiliation, are situated on the right bank of Holes Creek and east of Lamme Road. Site 33MY153, a habitation site of undetermined cultural affiliation, is located on the left bank of Holes Creek, west of Lamme Road and north of Bellbrook Road. The fourth site is 33MY306, the Joseph Dryden Mill Site, which probably dates to the early 19th Century. This mill formerly stood on the left bank of Holes Creek near the Conrail Railroad.

As a result of extensive industrial and suburban landscape alterations, the infield findings of an archaeological reconnaissance were completely negative. However, on the basis of available area literature, it is considered advisable that the project area be monitored by a professional archaeologist during any future construction activities in the area.

The National Register of Historic Places was consulted and there are no recorded register properties in the lower reaches of either creek.

Human Resources

DEMOGRAPHIC DATA

Montgomery County had a 1975 population of 587,507. Approximately 35 percent of this population, or 206,000, lived in Dayton just north of the study area. The 1970 census indicated that Montgomery County and Dayton had populations of 606,148 and 244,564, respectively, and that 112,640 persons, or 18.5 percent of the population, resided in the communities of West Carrollton (10,748); Miamisburg (14,797); Kettering (71,864); Centerville (10,333); and Moraine (4,898) which surround the study area. Figure A-2 shows the corporate limits within the study area. The 1975 population data for Montgomery County and the communities surrounding the study area reflected a decrease in

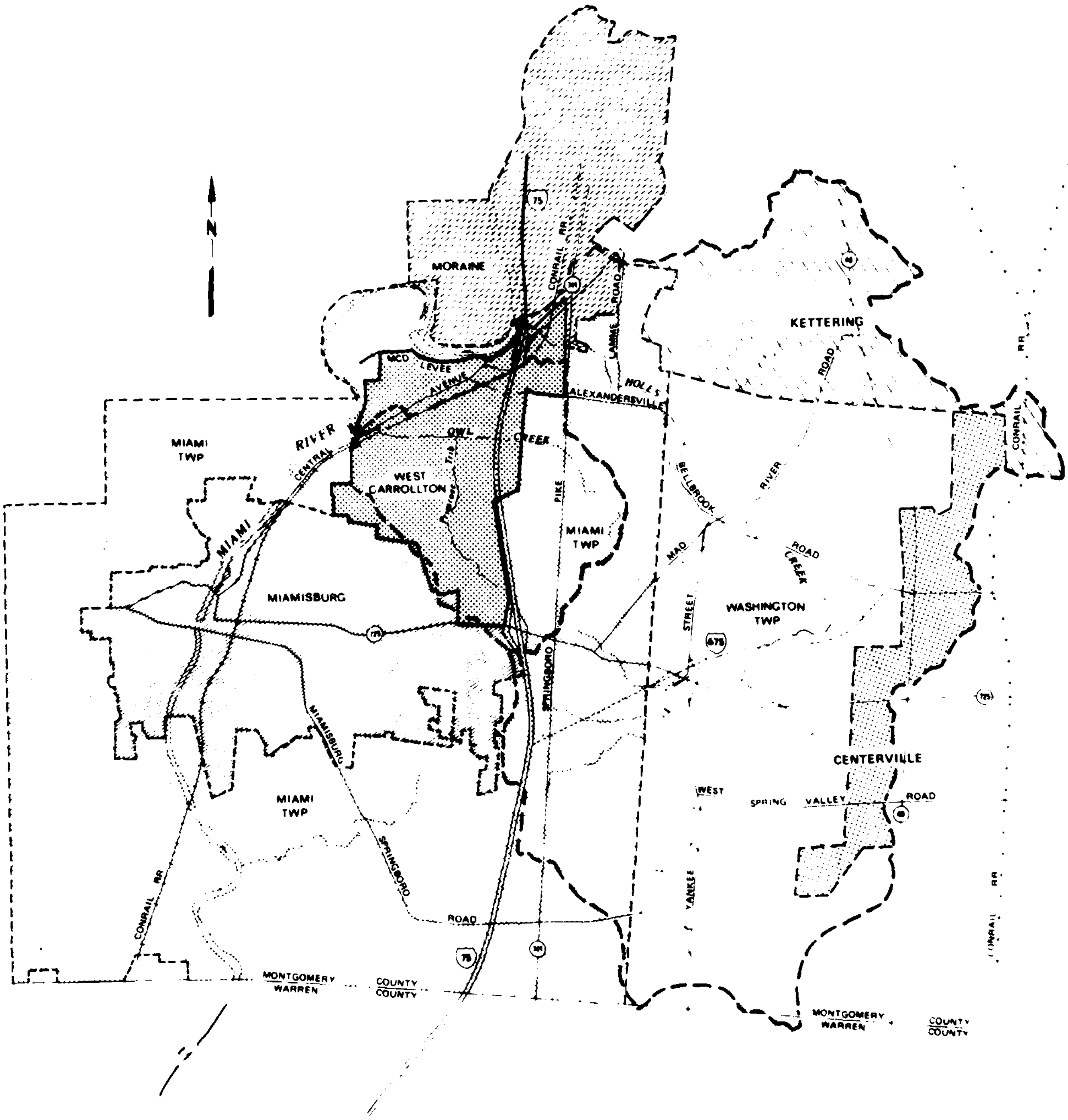


FIGURE A-2: CORPORATE LIMITS

Montgomery County, Dayton, Kettering, and Moraine and an increase in West Carrollton, Miamisburg, and Centerville as follows: Montgomery County (587,507); Dayton (205,986); Kettering (69,949); Moraine (4,734); West Carrollton (13,292); Miamisburg (15,122); and Centerville (14,879). The loss of population in Montgomery County occurred as a result of outmigration. The increase in the population of West Carrollton, Miamisburg, and Centerville was largely due to internal migration from the big city to the suburb. An indication of the urbanization of suburban areas is shown by the significant decrease in farm population, which was reduced by 32.8 percent, between 1960 and 1970 in Montgomery County.

During the period 1970 to 1975, there was a decrease in the population group below age five, due to a decline in the birth rate, and a substantial decrease in the 33 to 44 age group, due to outmigration which is continuing.

These population shifts indicate that population projections for the remainder of the 20th Century would be uncertain, although some population reports project that by the year 2000, the population of Montgomery County would be in excess of one million. Population shifts indicate a likely movement from middle and outer limits of cities to suburban areas resulting in rather rapid residential and commercial development with a substantial growth in population density and loss of vacant and agricultural land. Existing suburban areas would become congested urban areas unless anticongestion criteria are enforced. The study area comprises 7.3 percent of the Montgomery County land area and approximately 9 percent of the County population lives within the basin.

DEMOGRAPHIC SUMMARY DATA
FOR MONTGOMERY COUNTY
(Source 1970 Census)

Residential Population Data:

Total Population	606,148
Population per Square Mile	1,326
Changes in Population (1960-1970)	
Percentage of Change	+15.4
Percentage of Net Migration	+1.2
Total Female Population	312,444
Percentage of Population	51.6
Total Urban Population	558,262
Percentage of Population	92.1
Population by Race	
Black	83,672
White	520,489
Other	1,987
Population by Age	
Median Age	27.4
Percentage of Children under 5	8.8
Percentage of Population 18 and Older	65
Percentage of Population 5 to 17	26.2
Percentage of Population 18 to 64	57.2
Percentage of Population 65 and Older	7.8

Historic population data for available governmental units are provided in Table A-2 below.

TABLE A-2

HISTORIC POPULATION (1950-1975)
DAYTON SMSA, MONTGOMERY COUNTY,
MIAMI TOWNSHIP, AND WASHINGTON TOWNSHIP

	1950	1960	1970	1975
Dayton SMSA	457,333	727,375	852,531	835,708
Montgomery	398,441	527,080	608,413	587,705
Miami Township	18,225	32,082	43,020	46,250
Washington Township	2,754	10,605	27,730	29,590

HEALTH

Montgomery County has four large general hospitals, a hospital specializing in children, a regional Veterans Administration medical center, and a large State mental hospital. These facilities have services, manpower, and other resources to provide a range of primary and secondary health care to residents of the county and the region. These facilities also provide specialized tertiary health care services such as burn care and cardiac surgery.

Health manpower per number of people is currently as follows.

Physicians	791	1 per 766
Dentists	305	1 per 1,987
Dental Hygienists	144	1 per 4,209
Nurses	2,494	1 per 243
LPN's	1,040	1 per 583
Optometrists	64	1 per 7,471
Physical Therapists	53	1 per 11,437
Speech and Hearing Therapists	73	1 per 8,303
Chiropractors	49	1 per 12,370
Occupational Therapists	29	1 per 20,901
Dietitians	117	1 per 5,181
Podiatrists	31	1 per 19,553
Pharmacists	365	1 per 1,661

The Miami Valley Health Systems Agency, a creation of the National Health Planning Act, is charged with the responsibility of alleviating health problems in the Miami Valley Region in cooperation with State and local agencies and health services providers.

There are some 40 nursing homes which provide long-term health care and resident care with a licensed capacity of 3,415 beds in Montgomery County. Ambulance services are provided throughout the County by Emergency Medical Services connected mainly with fire departments. Most of these services are connected with centralized dispatching or radio equipment and have direct contact with hospital emergency rooms. All ambulance services, fire departments, and rescue squads operate on a 24-hour basis and cooperate as needed.

EDUCATION

Montgomery County and the study area have experienced a strong growth in educational activity since World War II. Today, educational levels of the County compare favorably with those of Ohio and the nation. Currently, the median number of school years completed in the County is 12.2. The percentage of population having less than 5 years of schooling is 3.1, and the percentage of those having 4 years of high school is 55.5. The level of higher education is particularly strong, as the percentage of population having 4 years of college or more is 11.2, which is above the national average of 10 percent.

Educational activity in the County is characterized by a strong rise in female enrollment in all levels of education and a steady increase in enrollment of the black population. However, traditional education in general high school and college level liberal arts is emphasized, although the main occupational demand requires vocational, scientific, and technological training.

Development and Economy

The economy of the study area is characterized by a strong activity in manufacturing and a moderate shift from production of goods to services.

The study area and Montgomery County produce durable goods above the national average and nondurable goods below the national average. However, recent industrial activity indicates that the production of nondurable goods is gaining momentum, while the production of durable goods is not declining except in the percentage of total production. Meanwhile, services in general and finance, insurance, and real estate, in particular, have achieved a phenomenal growth.

In the past, manufacturing provided both the majority of jobs and the majority of wages. Today, while manufacturing still provides the majority of wages, services and wholesale and retail trade provide the majority of jobs. Agricultural activity has experienced a sharp decline in farm employment. Today farms have become fewer, larger, and more mechanized.

In general, the economy of the Dayton Standard Metropolitan Statistical Area (SMSA) has been growing, but its growth lags behind economic growth in the nation due to geographic shifts of industrial activity and employment opportunities from the eastern parts of the nation to other parts.

ECONOMY AND LABOR FORCE

The major skills and occupations of the labor force are diverse due to a diversity of industrial and commercial activities. There is a concentration of heavy industries in the communities surrounding the study area. These industries produce paper and allied products, rubber and plastic products, and primary metal products. The area is especially convenient for heavy industries because it is served by the Conrail Railroad, is close to Interstate Highways 75 and 70, and is within easy reach of both labor markets and desirable residential areas. Agriculture contributes to the economy, but is not a major employer and its value to the economy is expected to decrease as farmland is converted to residential and commercial complexes.

Substantial commercial activities take place within the general area primarily in finance, retail services, and wholesale and retail trade. Several of the top 500 United States companies, as listed by Fortune Magazine,

have major facilities in Montgomery County. Over 80 percent of all future industrial and commercial growth in the Dayton SMSA is expected to occur in Montgomery County. Potential sites for new industrial and commercial development are available in the area for both expansion of existing areas and development of new areas. Eleven of the potential sites are allocated for industrial parks which total approximately 1,850 acres. Large development sites which range from 200 to 900 acres are evenly distributed throughout the peripheral areas of the County. German, Miami, and Washington Townships in the south and communities of Vandalia, Trotwood, and Brookville in the north expect rapid economic growth in the next few decades. This growth should be accelerated when construction of a proposed circumferential highway takes place to connect Interstate Highway 70 in northern Montgomery County to the southern parts of the Dayton SMSA.

Montgomery County will continue to be the hub of industrial and commercial development in the Dayton SMSA. The growth of this area requires priming facilities such as sewers and utilities. This growth also indicates substantial increases in the labor force.

EMPLOYMENT

Employment of men and women in the study area has been considerably above the national average and somewhat above the Ohio average. The labor force is 61.8 percent male and 38.2 percent female and comprises 41 percent of the population. OBERS predicted that the labor force will be 46 percent of the population by the year 2000. Percentages of individuals employed in 1972 in various industrial and commercial activities are shown in Table A-3.

TABLE A-3

MONTGOMERY COUNTY EMPLOYMENT BY CATEGORIES
1972

Category	Employees	Percentage
Manufacturing	102,293	46.1
Contract Construction	10,250	4.6
Mining	367	0.1
Transportation, Communications and Utilities	10,322	4.7
Wholesale Trade	10,839	4.9
Retail Trade	40,460	18.2
Finance, Insurance, and Real	9,029	4.1
Services	37,704	17.0
Agricultural	218	0.1
Other	483	0.2
Total	221,962	100.0

INCOME

For Montgomery County, the estimated per capita income for 1974 was $4,902 and ranged around the study area from a high of $5,977 in Kettering to a low of $4,091 in Dayton. The averages for the State and the nation were $4,560 and $4,570, respectively.

In 1970, mean family income around the basin ranged from a high of $15,533 in Kettering to a low of $11,400 in Miamisburg. In comparison, mean family income was $11,488 in the State of Ohio; $12,605 in Montgomery County; and $10,329 in the City of Dayton. Between 1960 and 1970, family income increased from $6,821 to $11,413, or 67 percent in Montgomery County, although much of this was due to inflation.

TRANSPORTATION

Several highways and railroads serve the study area. Interstate Highway 75 is the major east-west thoroughfare. In addition, there are several State and Federal highways dissecting the area. Conrail Railroad runs through the area in a northeasterly-southwesterly direction and connects the area with major markets of the northeast.

There is a public transportation service within the Holes Creek-Owl Creek Basin, and other public transportation services exist or are in the planning stages within the County. However, the principal mode of travel by individuals is the privately owned vehicle.

A substantial increase in intracounty travel is expected to occur as a result of the proposed circumferential highway which will connect the northern parts of Montgomery County with the southern parts. The proposed circumferential highway is discussed in more detail in Addendum A-1. Intraarea travel will increase as a result of expansion in employment and population density within the study area. The greatest increase in travel will occur in nonwork related trips which usually respond to rising income, more frequent car ownership and emphasis on leisure activity. Higher population density tends to increase the number of noncar households and the demand for inexpensive, rapid, public means of transportation. Planning and zoning authorities in the State, the region, and the study area have made plans and regulations to maintain an adequate transportation system.

HOUSING

Housing in the study area is characterized by a gap between supply and demand. In 1970, there was a deficit of 18,300 housing units in the Miami Valley Region with a significant deficit in Montgomery County. The following data illustrate the housing situation in 1970.

HOUSING DATA IN MONTGOMERY COUNTY
(Source 1970 Census)

Total Number of Housing Units	197,309
Percentage of Change 1960-1970	+21.6
Median Number of Rooms per Housing Unit	5.2
Percentage Single Unit Structures	71.6
Percentage of Structures which were Built before 1950	47
Average Number of Persons per Household	3.1
Percentage of Owner Occupied Housing Units	64.1
Median Value of a Housing Unit	$18,775
Percentage of Units Lacking Some or All Plumbing Facilities	2.3

Although housing may be described as good, there are small pockets of inadequate housing in the study area. West Carrollton was one of the areas in which unsound housing is concentrated outside Dayton.

Although there is a strong demand for all types of single and multiple family dwellings, including mobile homes, construction of new single dwellings for upper middle and upper income families predominates and usually matches existing demand. The main gap in the study area occurs between housing demands and supply for lower middle and lower income families and individuals whose needs could be met by construction of new multiple units and low cost or subsidized single units. There is evidence that low cost housing supply is improving, but is still far from the goal of meeting this demand.

Although the population of the Dayton SMSA has decreased slightly since the 1970 census, the study area has experienced a considerable net population increase, arising partially from migration from Dayton to the suburbs where employment and/or housing opportunities offer a greater promise. This migration contributes to the rising housing demand in the study area while the rising cost of home construction contributes to the scarcity of housing supply.

Condition If No Federal Action Taken

General

The future development of the immediate study area under "without project conditions" would be approximately the same as with the project. This is due for four main reasons. One, planned commercial and industrial land use generally avoids flood damage susceptibility by means of allocating numerous commercial and industrial sites in high areas and the ability of developers to build over elevated foundations in low areas. Two, the location of the area within convenient proximity to major highways, railroad, and air avenues of transport would continue to attract new labor-intensive commercial and industrial activities. Three, the readily available skilled and semiskilled labor supply of the Dayton SMSA would respond sufficiently to prospective development needs. Four, population growth which would come as a result of the expanding labor market and the traditional migration from the big city would be met by existing residential land use planning which reduces flood damage susceptibility requiring residential building in the low areas to be elevated above the 100-year flood level (See Land Use Map - Figure A-3).

Generally, industrial and commercial development is not dependant upon the capability of flood plain land to support economic stability and growth. The "without" demographic and economic conditions in the study area and sparsity of developable land manifest a new residential construction trend. Onsite inspection and conversation with local planners, realtors, and property owners and developers revealed a trend towards the construction of upper income family units and moderate income multifamily units. New construction of moderate and low income single family units and low income multifamily units would be scarce due to the relatively high price of land suitable for residential development and the high cost of construction. The study area would therefore have a housing shortage for moderate and low income families especially in view of an anticipated population growth. This shortage could prompt new commuting activities from nearby areas where lower and moderate income housing units are available.

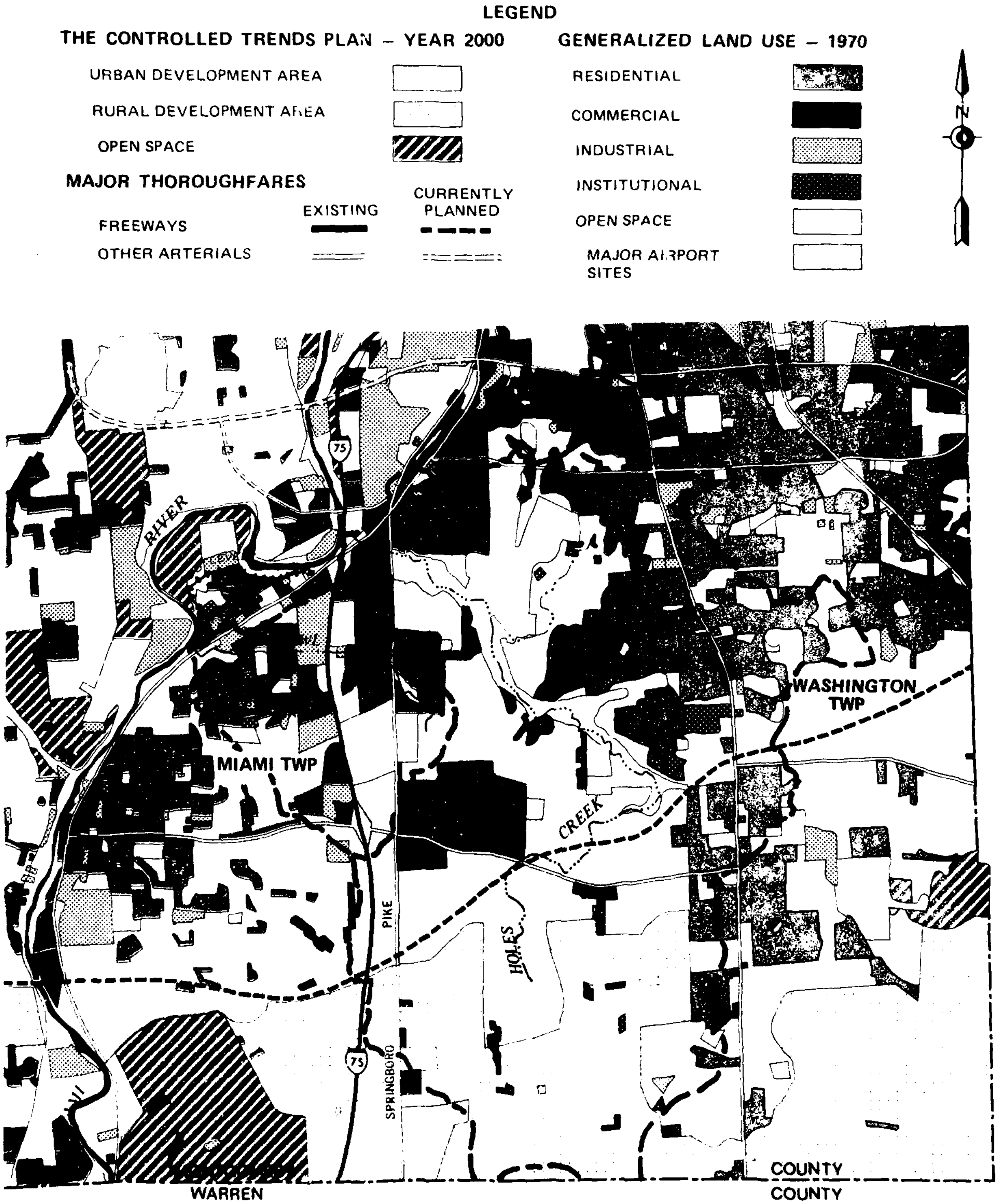


FIGURE A-3: LAND USE

Economic development would be characterized by a moderate increase in manufacturing, a higher increase in wholesale and retail trade activities, and especially in services, with expected increases in employment and income. Average increases in income would be slightly above the rate of inflation. A transition would occur whereby the economy would move from a manufacturing-centered type to a service-oriented type although manufacturing would continue to maintain the largest single share in providing jobs and income.

Population

The population of Montgomery County will increase by only 1.3 percent between the years 1970 and 1995, according to projections of the Ohio Department of Economic and Community Development (See Table A-4); however, a strong population growth in the immediate study area has been projected by the Miami Valley Regional Planning Commission. These projections are shown in Table A-4.

TABLE A-4

MONTGOMERY COUNTY AND STUDY AREA
(Population Projections [1970-1995])

Population	1970	1975	1980	1985	1990	2000
1/ Miami Township (Includes Carlisle, West Carrollton, & Miamisburg)	43,020	46,250	50,100	54,100	58,100	67,300
1/ Washington Township (Includes Centerville)	27,730	29,590	32,500	35,300	38,100	44,700
2/ Montgomery County	607,700	590,400	569,400	569,800	600,300	615,800

1/ Source: Miami Valley Regional Planning Commission, Controlled trends.
2/ Ohio Department of Economic and Community Development.

OBERS population projections for BEA 63, which contains the study area, indicate that the BEA would have a total increase of about 18 percent between the years 1980 and 2000. Projections of the Miami Valley Regional Planning

Commission (MVRPC) for the study area indicate that the Miami Township would have a total increase of about 34 percent and the Washington Township would have a total increase of about 37 percent during the same period. Projections of the MVRPC for the study area have taken into accout intra-area population movements on the basis of development trends in each local area. Since OBERS projections incorporate total fertility rates per 1,000 women and interarea net migration, they are more representative of larger areas. Since the study area has development trends and population movements, largely unlike those of the BEA, the MVRPC projections for the local study area were considered more typical of the area than disaggregation of the area share on the basis of OBERS projection for the BEA. Additional discussion supporting the validity of MVRPC projections is provided in Addendum A-2. This Addendum also provides Holes Creek flood plain population projections.

Land Use

The traditional decline in vacant and agricultural land is expected to continue as a result of anticipated industrial, commercial, and residential development. Meanwhile, the area would develop both economically and demographically considerably faster than the State and national averages.

The Miami Valley Regional Planning Commission (MVRPC) has recently published information which projects land use in Montgomery County and the communities surrounding the study area to the year 2000. Table A-5, A-6, A-7, and A-8 include pertinent data gleaned from publications of the MVRPC. The data indicates the existence of a strong urbanization trend characterized by a rapid increase in the use of land for residential, commercial, industrial, institutional, and open space purposes, and a corresponding decrease in vacant and agricultural land. Figure A-3 depicts the projected land use of the area. In 1975, vacant and agricultural land was 190,659 acres in Montgomery County, and in communities surrounding the study, it was 697 acres in Moraine; 1,713 acres in Kettering; 591 acres in West Carrollton; 5,717 acres in Miamisburg; and 4,458 acres in Washington Township including Centerville. By the year 1995, projected vacant and agricultural land will be 141,913 acres in Montgomery County; 11 acres in Moraine; 32 acres in Kettering; 55 acres in

West Carrollton; 3,719 acres in Miamisburg; and 2,385 acres in Washington Township. Residential development in the County will consume more land than all other categories of land use combined. Land use projections reflect the emphasis on open space which will require more acreage than the combined use of all categories except residential. Industrial development will consume more acreage than commercial and institutional development combined.

TABLE A-5

LAND USE PROJECTIONS
WEST CARROLLTON, OHIO 1/

Land Use	1975	1980	1985	1990	1990
Residential	1,409	1,592	1,658	1,658	1,658
Commercial	33	44	57	57	57
Industrial	571	637	670	670	670
Institutional	43	46	51	51	51
Open Space	805	912	961	961	961
Vacant and Agriculture	591	221	55	55	55
Total Acreage	3,452	3,452	3,452	3,452	3,452

1/ Exhaustion of all land suitable for development is expected by 1985. This includes West Carrollton City limits only and should not be confused with the study area shown on Figure A-3.

TABLE A-6

LAND USE PROJECTIONS
MIAMISBURG

Land Use	1975	1980	1985	1990	1990
Residential	1,805	2,127	2,424	2,651	2,862
Commercial	126	146	169	178	207
Industrial	449	550	647	719	787
Institutional	48	53	61	67	74
Open Space	564	728	869	959	1,060
Vacant and Agriculture	5,717	5,105	4,539	4,135	3,719
Total Acreage	8,709	8,709	8,709	8,709	3,709

TABLE A-7

LAND USE PROJECTIONS
DAYTON URBANIZED AREA IN MIAMI TOWNSHIP 1/

Land Use in Acres	1970	1975	1980	1985	1990	1995	2000
Residential	3,774	4,733	5,596	6,282	7,076	7,729	8,233
Commercial	270	342	433	526	660	802	945
Industrial	746	936	1,108	1,242	1,407	1,542	1,652
Institutional	77	97	133	174	252	337	432
Open Space	1,840	2,237	2,659	3,057	3,513	3,982	4,389
Vacant and Agriculture	2,916	2,839	2,684	2,500	2,132	1,728	1,270
Total Acreage 2/	9,623	11,184	12,613	13,781	15,040	16,120	16,921

1/ Includes Carlisle (part), Miamisburg, and West Carrollton.
2/ Increase in total acreage due to projected rearrangement of boundaries, including annexation.

TABLE A-8

LAND USE PROJECTIONS
MONTGOMERY COUNTY

Land Use in Acres	1970	1975	1980	1985	1990	1995	2000
Residential	51,911	60,131	68,695	75,816	81,876	85,250	86,226
Commercial	3,728	4,279	5,017	5,934	6,807	7,670	8,581
Industrial	6,549	7,832	9,361	11,029	12,400	13,781	15,351
Institutional	1,869	2,049	2,389	2,955	3,536	4,215	5,074
Open Space	31,775	34,035	36,626	39,891	43,097	46,156	49,384
Vacant and Agriculture	203,153	190,650	176,897	163,360	151,269	141,913	134,369
Total Acreage	298,985	298,985	298,985	298,985	298,985	298,985	298,985

Problems, Needs and Opportunities

The purpose of this section is to define and discuss the water resources needs and problems in the study area. Investigations indicate that the major problems and needs are confined to flooding, recreation, and the need to enhance and preserve the existing open spaces and environment.

Potential for problems and needs for other water uses was considered and found either not to exist or their solutions not capable of being met in the study area. Water quality in Holes Creek is generally good with no known point source pollutant discharges. Owl Creek above the Elm Street Bridge has intermittent flow and appears to have no pollutant discharges. However, a paper company next to the Conrail Railroad discharges effluence from a treatment plant into Owl Creek. This discharge appears to be polluted due to its milky coloration and apparent absence of aquatic life. Further treatment at the source appears to be the only practical solution. Whether solutions to this problem are being considered in a Section 208, Public Law 92-500, study underway by the Miami Valley Regional Planning Commission is unknown. Water supply for the area is provided by wells. The "Southwest Ohio Water Plan" indicates that the present system will be sufficient until the late nineties. Two potential courses of action are available to meet needs at that time. New well fields can be developed or the area can be served by a Dayton regional system. This latter course of action is recommended in the above-mentioned report. No irrigation or drainage problems are known to exist in the study area. The development of hydroelectric power in either Holes Creek or Owl Creek would not be practical due to their size and absence of damsites.

Flooding

The Miami Conservancy District and West Carrollton officials have reported flood problems along both Holes Creek and Owl Creek. The extent of these problems has been identified by developing hydrologic data which

considered such aspects as storm characteristics, stream characteristics, extent and character of the basins and flood plains, and projected future characteristics. These hydrologic data were used in developing estimated present and future flood damages.

GENERAL HYDROLOGIC DESCRIPTION

The Holes Creek and Owl Creek Basins are located along the Miami River and the southwestern edge of the metropolitan area of Dayton, Ohio. Suburban growth has occupied much of the Holes Creek Basin and practically all of the Owl Creek Basin. The remaining open space is rapidly being developed into residential and commercial areas. Essentially, complete urbanization of both drainage areas is expected by the year 2000.

Drainage areas on Holes Creek vary from 28.2 square miles at its confluence with the Miami River to 19 square miles at Mad River Road, and drainage areas on Owl Creek vary from 4.4 square miles at its confluence with the Miami River to 2.6 square miles at Alexandersville Road. Stream slopes for Holes and Owl Creeks are 24 and 22 feet per mile, respectively.

Existing land uses are primarily residential and commercial. Future growth in the Holes Creek area will be primarily residential and commercial, with some office and light industry by the year 2000.

GENERAL STORM CHARACTERISTICS

The storm type causing widespread flooding and especially flooding along the Miami River and major tributaries is the typical Ohio River Basin winter or early spring storm. The storm is usually centered on an axis along the Ohio River valley from southeastern Missouri to western New York. This type storm generally moves up the Ohio River valley in a northeasterly direction and caused the major floods of march 1913, January 1959, March 1963, and March 1964. As was the case in some of the above floods, runoff from this type storm is often intensified by antecedent conditions.

Another storm type that generally causes the severest flood conditions on small tributaries, like Owl and Holes Creeks, is the severe summer cloudburst. This storm normally has high intensive rainfall for relatively short duration, which frequently causes flash floods. A storm of this type occurred in Cincinnati on 2 September 1971 when 2.61 inches fell in a 2-hour period and 3.39 inches for the day.

HISTORICAL FLOODS

Severe flooding occurred through much of Ohio in January 1959. Plate A-1 is an isoline map of storm rainfall totals for the period 19-21 January 1959. Plate A-2 shows the mass rainfall curve at the Dayton Airport, and Plates A-3 and A-4 show the 1959 flood profiles on Holes Creek and the Miami River, respectively.

High water marks on Holes Creek for the 1959 flood were obtained from the Miami Conservancy District. A peak discharge of 4,730 c.f.s for the 1959 flood was computed by the Miami Conservancy District at a site downstream and adjacent to Mad River Road. The general absence of gaging data for Holes and Owl Creeks prevents the documentation of historical floods; however, local interests have reported past damaging headwater floods for both streams.

Climatological data are available from records on file at the National Climatic Center in Asheville, North Carolina. Precipitation information is available for the following gages (see next page).

RECORDING GAGES

Station	County	Latitude	Longitude	Elevation	Observer
Dayton WSOAP	Montgomery	39°54'	84°12'	995	National Weather Service
Germantown Dam	Montgomery	39°38'	84°24'	740	Ray Geiger, Jr.
Xenia Treatment Plant	Greene	39°43'	83°58'	820	Paul Sparrow

NONRECORDING GAGES

Station	County	Latitude	Longitude	Elevation	Observer
Dayton	Montgomery	39°46'	84°11'	745	8:00 a.m. Miami Conservancy District
Miamisburg	Montgomery	39°39'	84°16'	720	7:00 a.m. Miami Conservancy District
Xenia 5SSE	Greene	39°37'	83°54'	950	6:00 p.m. Glenn E. Harner

Stream gage data are recorded for the Miami River at Miamisburg, Ohio, and at Dayton, Ohio. The gage at Miamisburg is located 600 feet downstream from the bridge on State Highway 725. The period of record contains broken intervals from March 1916 to date. The gage at Dayton is located 1,000 feet downstream from the Main Street Bridge in Dayton. The period of record contains broken intervals from April 1905 to date. Gage height records since January 1892 are contained in reports of the National Weather Service. Data for the stream gages on the Miami River are published by the U.S. Geological Survey. Much of the information is obtained from cooperation with the Miami Conservancy District.

The Miami Conservancy District has maintained a stream gage on Holes Creek at Mad River Road since 1961. The value of this gage is limited because of discrepancies in the rating curve. However, high-water data for the January 1959 flood on Holes Creek and the Miami River were obtained from the Miami Conservancy District. No streamflow information is available for Owl Creek.

EXTENT AND CHARACTER OF THE STUDY AREA

The West Carrollton flood damage study area extends along Holes Creek and Owl Creek, both tributaries of the Miami River. Plate A-5 shows a map of the study area. The Holes Creek flood problem area extends from the Conrail Railroad upstream to Mad River Road, a stream distance of about 3 miles. Flood prone areas studied along Owl Creek extend from its mouth to Alexandersville Road, a stream distance of about 1.2 miles. For evaluation purposes, the study area was divided into the stream reaches and ponding areas shown in Table A-9.

TABLE A-9

DESCRIPTION OF STUDY STREAM REACHES AND PONDING AREAS
HOLES CREEK AND OWL CREEK
WEST CARROLLTON, OHIO

HOLES CREEK	
HC-1	From Conrail Railroad Bridge to Springboro Pike
HC-1P (Ponding Area)	Upstream of Interstate Highway 75 and Conrail Railroad between Holes Creek and Owl Creek
HC-2	From Springboro Pike to Lamme Road
HC-3	From Lamme Road to Alexandersville-Bellbrook Road
HC-4	From Alexandersville-Bellbrook Road to Mad River Road
OWL CREEK	
OC-1	From mouth to Conrail Railroad Bridge
OC-2	From Conrail Railroad Bridge to Elm Street
Ponding Area	On right bank between Conrail Railroad and Elm Street
OC-3	From Elm Street to Alexandersville Road
Ponding Area	On right bank upstream of Elm Street

NATURE AND EXTENT OF FLOODING

The study area is subject to headwater flooding from Holes Creek and Owl Creek and backwater flooding from the Miami River.

Two basic types of flooding were evaluated in this report. One type involves conventional flooding along Holes Creek and Owl Creek as indicated by stream flood profiles. The other type involves an evaluation of ponding in low areas from stream spillovers. When spillover occurs, flows along streets and through low areas often ponds in low lying residential areas causing extensive damage. The stream reaches evaluated are shown on Plate A-5 and are described in Table A-9. The reach HC-1 ponding area is fed by spillovers from Owl Creek during low stage floods and from Holes and Owl Creeks and the Miami River during higher stage floods. The two ponding areas along the right bank of Owl Creek in reaches OC-2 and OC-3 are fed by spillovers from Owl Creek only.

Flood damage estimates and evaluations in this report are based on data gathered during flood damage surveys conducted by this office in late 1977 and early 1978. These surveys included a determination of damageable elevations, appraisal of property values, and interviews for estimates of damages for recurrence of various flood heights. Both the Holes Creek and Owl Creek flood plain areas are extensively urbanized, including residential, commercial, industrial, public, transportation, and utility properties.

Table A-10 shows estimated value of property within the study reaches for a 1,000-year frequency flood and damages for recurrence of the standard project flood (SPF), 100-year flood, and 10-year flood.

TABLE A-10

UNIT, VALUE, AND DAMAGE FOR RECURRENCE OF SPECIFIC FLOOD HEIGHTS 1/
ALONG HOLES AND OWL CREEKS
WEST CARROLLTON, OHIO

Property Category	Number of Units 2/	Property Value in $1,000 2/	Damages in $1,000 for Specific Flood Heights: SPF 3/	100 Years	10 Years
HOLES CREEK					
HC-1					
Residential	122	5,104.4	2,106.8	377.6	103.1
Commercial	8	4,099.1	971.0	396.3	204.2
Public	---	---	---	---	---
Transportation	L.S. 4/	412.2	4.6	4.2	3.9
Utilities	L.S. 4/	230.7	18.4	5.3	1.5
Total		9,846.4	3,100.8	783.4	312.7
HC-1 (Left Bank Ponding)					
Residential	280	14,334.3	3,137.3	96.2	22.9
Commercial	---	---	---	---	---
Public	1	11,266.8	787.8	3.4	2.3
Transportation	L.S.	1,291.6	98.5	4.9	1.5
Utilities	L.S.	326.3	34.4	0.6	0.2
Total		27,219.0	4,058.0	105.1	26.9

TABLE A-10 (Continued)

Property Category	Number of Units 2/	Property Value in $1,000 2/	Damages in $1,000 for Specific Flood Heights		
			SPF 3/	100 Years	10 Years
HC-2					
Residential	265	12,659.1	2,702.2	1,072.2	515.3
Commercial	1	34.4	8.9	2.3	0.5
Public	---	---	---	---	---
Transportation	L.S.	790.1	8.1	4.8	3.5
Utilities	L.S.	651.1	28.1	11.8	6.0
Total		14,134.7	2,747.3	1,091.1	525.3
HC-3					
Residential	121	3,847.2	45.8	7.3	2.6
Commercial	---	---	---	---	---
Public	1	143.2	51.5	11.3	0.2
Transportation	L.S.	377.9	64.1	13.7	6.1
Utilities	L.S.	210.6	11.5	0.2	---
Total		4,578.9	172.9	32.5	8.9
HC-4					
Residential	8	779.8	223.3	76.0	48.7
Commercial	---	---	---	---	---
Public	---	---	---	---	---
Transportation	L.S.	68.7	8.0	3.8	1.4
Utilities	L.S.	22.0	2.0	0.2	0.1
Total		870.5	233.3	80.0	50.2

TABLE A-10 (Continued)

Property Category	Number of Units 2/	Property Value in $1,000 2/	Damages in $1,000 for Specific Flood Heights SPF 3/	100 Years	10 Years
OC-3					
Residential	105	3,501.4	423.7	362.5	326.3
Commercial	---	---	---	---	---
Public	---	---	---	---	---
Transportation	L.S.	237.0	2.4	2.3	2.2
Utilities	L.S.	62.8	8.4	6.3	5.7
Total		3,801.2	434.5	371.1	334.2
OC-3 (Right Bank Ponding)					
Residential	131	5,954.0	440.8	332.6	105.5
Commercial	1	286.3	1.1	---	---
Public	---	---	---	---	---
Transportation	L.S.	904.6	9.1	---	---
Utilities	L.S.	139.0	3.7	2.5	0.6
Total		7,283.9	454.7	335.1	106.1

TABLE A-10 (Continued)

Property Category	Number of Units 2/	Property Value in $1,000 2/	Damages in $1,000 for Specific Flood Heights SPF 3/	100 Years	10 Years
OWL CREEK					
OC-1					
Residential	117	2,174.0	721.4	581.7	27.5
Commercial and Industrial	7	12,779.3	914.3	445.6	7.4
Transportation	L.S.	377.9	38.4	32.0	23.8
Utilities	L.S.	325.0	22.4	12.7	3.2
Total		15,656.2	1,696.5	1,072.0	61.9
OC-2 (Left Bank)					
Residential	12	409.2	36.6	23.9	2.7
Commercial	---	---	---	---	---
Public	---	---	---	---	---
Transportation	---	---	---	---	---
Utilities	---	---	---	---	---
Total		409.2	36.6	23.9	2.7
OC-2 (Right Bank Ponding)					
Residential	48	1,572.0	251.9	210.2	69.4
Commercial	---	---	---	---	---
Public	---	---	---	---	---
Transportation	L.S.	195.8	1.6	1.3	---
Utilities	L.S.	139.8	6.0	4.8	1.1
Total		1,907.6	259.5	216.3	70.5

TABLE A-10 (Continued)

Property Category	Number of Units 2/	Property Value in $1,000 2/	Damages in $1,000 for Specific Flood Heights		
			SPF 3/	100 Years	10 Years
TOTAL STUDY AREA					
Residential	1,209	50,335.4	10,089.8	3,140.2	1,224.0
Commercial and Industrial	17	17,199.1	1,895.3	844.2	212.1
Public	2	11,410.0	839.3	14.7	2.5
Transportation	L.S. 4/	4,655.8	234.8	67.0	42.4
Utilities	L.S. 4/	2,107.3	134.9	44.4	18.4
TOTAL		85,707.6	13,194.1	4,110.5	1,499.4

1/ October 1979 values.
2/ Within 1,000-year flood plain.
3/ Represents SPF, except that damages for Owl Creek are for 1,000-year flood.
4/ L.S. means lump sum. These categories include damages not measurable in physical units.

Recreation and Open Spaces

The "Southwest Ohio Water Plan, Ohio Department of Natural Resources - 1976" indicates a need for nearly all types of recreational facilities in Montgomery County. However, the needs were computed only from demand and supply within Montgomery County and may reflect higher needs than what exists due to the population concentration of this County. Nevertheless, a needs does exist for additional recreational opportunities. Needs presented by the report and two recommended plans for meeting a portion of the needs are shown in Table A-11.

TABLE A-11

PROJECTED RECREATION NEEDS AND POTENTIAL PROJECTS
FOR MONTGOMERY COUNTY

Projected Needs in Acres

Boating			Fishing			Land-Based		
1980	2000	2020	1980	2000	2020	1980	2000	2020
24,400	45,600	65,800	800	1,300	1,600	31,100	48,600	64,600

Recommended Recreation Plans

Plans	Supply Provided in Acres		
	Boating	Fishing	Land-Based
Dayton Strip and Node Corridor	165	170	8,500
Germantown Primitive Corridor	---	115	2,400
Total	165	285	10,900

The Dayton Strip and Node Corridor plan would include purchasing land along the Miami River through Montgomery County and developing camping, hiking, picnicking, fishing, and boating facilities. Some portions of this plan in the Dayton area are being implemented. The overall plan does include

the reach of the Miami River in the West Carrollton area. The South Montgomery County Bikeway is presently under construction and crosses Holes Creek between I-75 and the Miami River. The Germantown Primitive Corridor is located in the Miami Conservancy District's Germantown Retarding Basin. Facilities provided will include primitive camping, picnicking, and hiking. The area is located about 10 miles west of West Carrollton. Local officials have also expressed a desire for restoring an old dam on the Miami River at West Carrollton for recreation and ground water recharge purposes. If not cost prohibitive, it appears that this proposal would be compatible with the corridor plan.

Both corridor plans have the potential to enhance as well as preserve open space lands for future generations. By preserving much of the remaining streambank environments, the plans will enhance the environment. Due to the urbanization of Montgomery County and the study area, all opportunities for preserving open lands and improving the environment should be given serious consideration.

Desires of Local Interests

The primary desire of local interests in the study area is relief from flooding. Increased urbanization has resulted in increased flooding and flood damages. The interest of local officials is expressed in Exhibits to Appendix C. This interest in the flood problems along Owl and Holes Creek was first expressed in the early 1960's as the Miami Conservancy District made preliminary studies of potential solutions for flood relief.

Planning Constraints

A portion of the 1936 Flood Control Act, enacted as Public Law 738 - 74th Congress, is as follows:

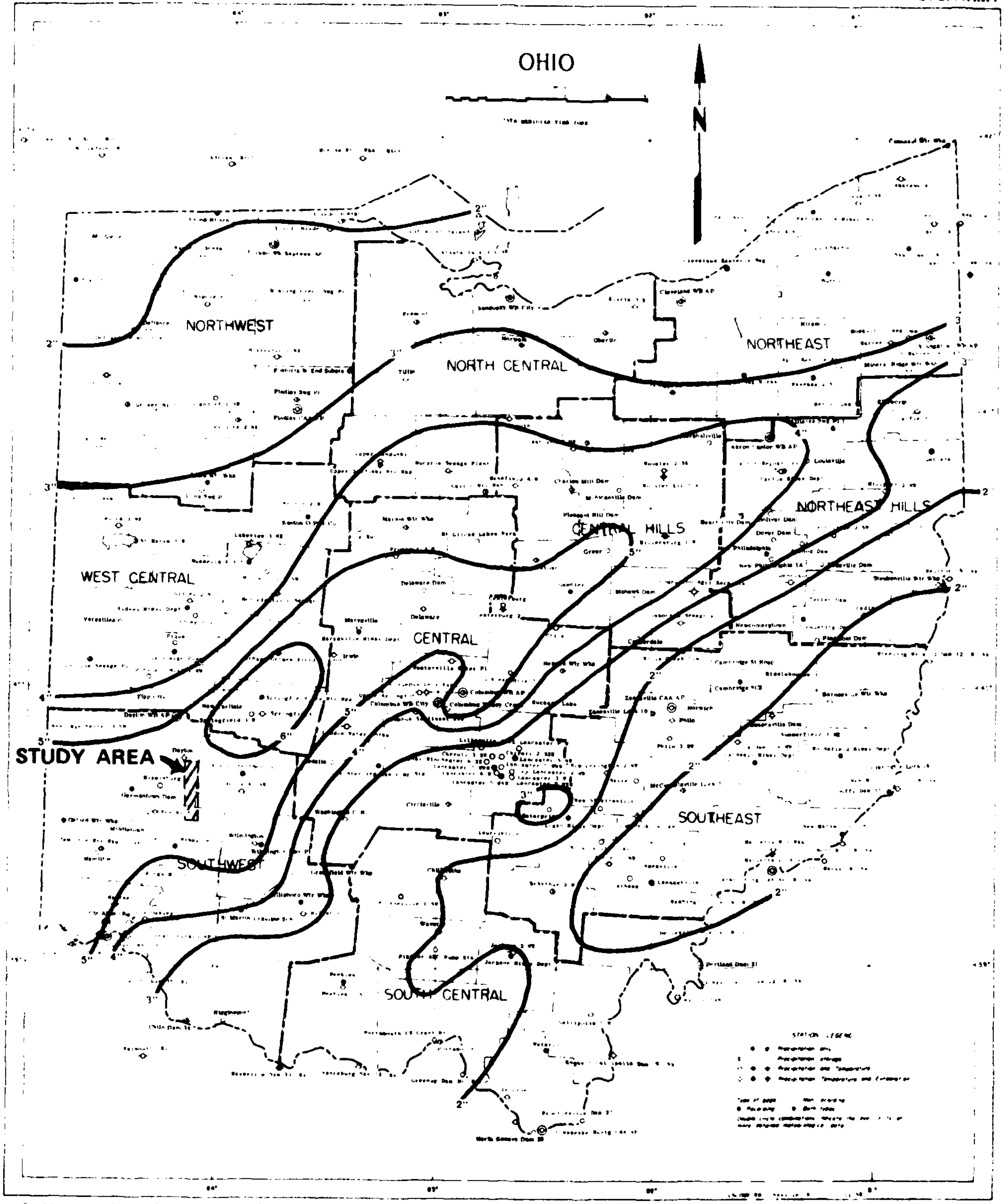
SECTION 1. It is hereby recognized that destructive floods upon the rivers of the United States, upsetting orderly processes and causing loss of life and property, including the erosion of lands, and impairing and obstructing navigation, highways, railroads, and other channels of commerce between the States, constitute a menace to national welfare; that it is the sense of Congress that flood control on navigable waters or their tributaries is a proper activity of the Federal Government in cooperation with States, their political subdivisions, and localities thereof; that investigations and improvements of rivers and other waterways, including watersheds thereof, for flood-control purposes are in the interest of the general welfare; that the Federal Government should improve or participate in the improvement of navigable waters or their tributaries, including watersheds thereof, for flood-control purposes if the benefits to whomsoever they may accrue are in excess of the estimated costs, and if the lives and social security of people are otherwise adversely affected.

Briefly, the above law establishes two constraints which are: the improvement should have net benefits and the residual condition must not adversely affect the security of the people. The net benefit constraint has been construed to mean that the combination of beneficial economic and environmental impacts must exceed the combination of adverse economic and environmental impacts.

Planning Objectives

Planning objectives result from a review of the problems and needs of the area, and of the desires of the public. This review resulted in the main need for flood relief along lower Holes and Owl Creeks. With consideration of the constraints and national objectives, the planning objectives were established as substantially reducing the flood impacts and providing a high degree of protection for the lower 1.3 miles of Owl Creek and the lower 3.3 miles of Holes Creek. A level of protection equal to or greater than the one percent chance flood is desired. As the occurrence of a severe flood is possible at anytime, the improvement should be accomplished in a timely manner.

CORPS OF ENGINEERS U. S. ARMY



Isolines are drawn through points of approximately equal values. Hourly precipitation data from recorder substations will be available in the publication "Hourly Precipitation Data".

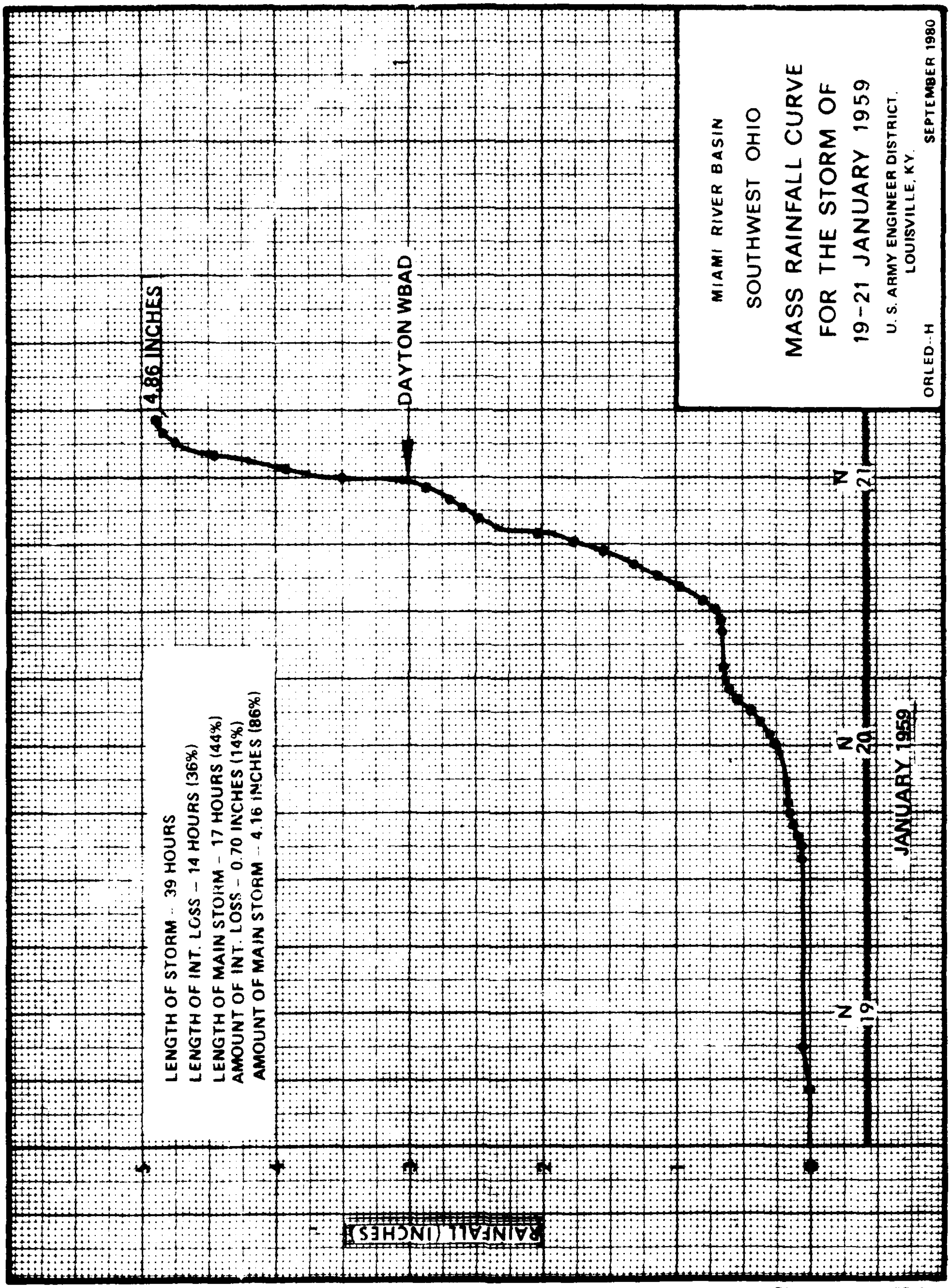
MIAMI RIVER BASIN

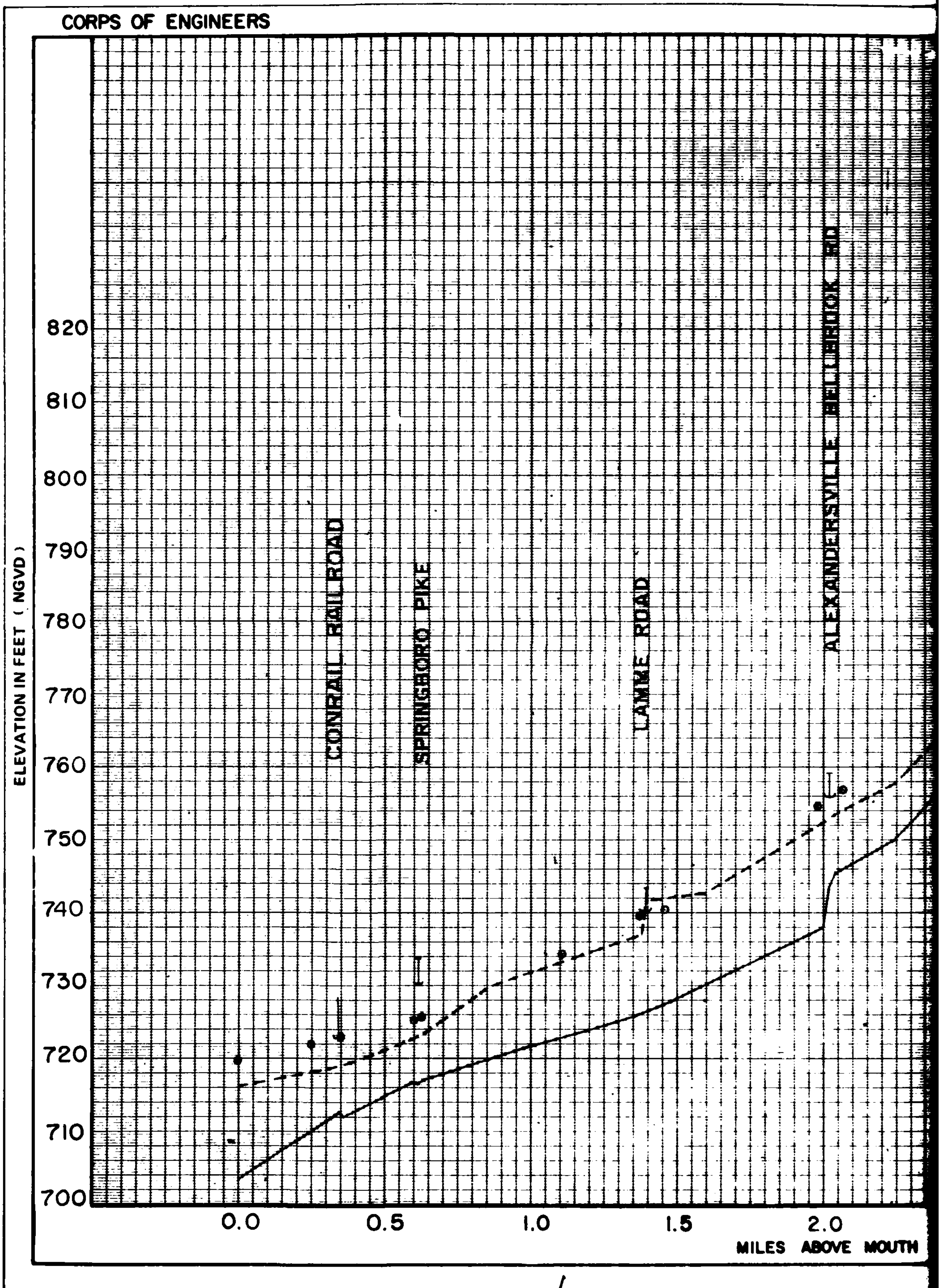
HOLES CREEK

ISOLINE MAP OF STORM RAINFALL FOR PERIOD 19–21 JANUARY 1959

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

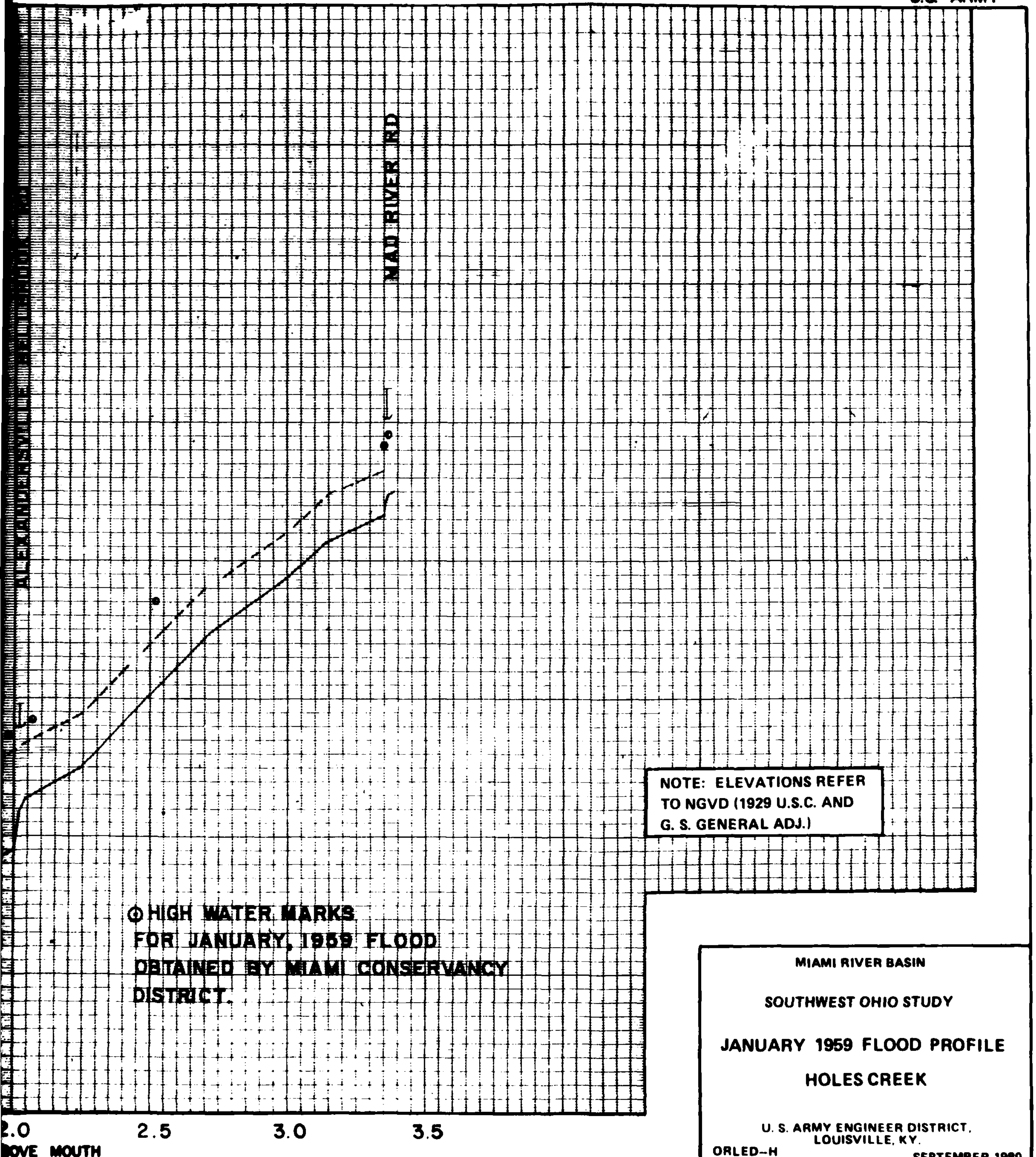
ORLPD–F SEPTEMBER 1980


MIAMI RIVER BASIN
SOUTHWEST OHIO
MASS RAINFALL CURVE
FOR THE STORM OF
19-21 JANUARY 1959
U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.
ORLED-H
SEPTEMBER 1980
4.86 INCHES
DAYTON WBAD
LENGTH OF STORM - 39 HOURS
LENGTH OF INT. LOSS - 14 HOURS (36%)
LENGTH OF MAIN STORM - 17 HOURS (44%)
AMOUNT OF INT. LOSS - 0.70 INCHES (14%)
AMOUNT OF MAIN STORM - 4.16 INCHES (86%)
N
19
N
20
N
21
JANUARY 1959
5
4
3
2
1
0
RAINFALL (INCHES)



CORPS OF ENGINEERS
ELEVATION IN FEET (NGVD)
820
810
800
790
780
770
760
750
740
730
720
710
700
CONRAIL RAILROAD
SPRINGBORO PIKE
LAMME ROAD
ALEXANDERSVILLE BELLBROOK RD
0.0
0.5
1.0
1.5
2.0
MILES ABOVE MOUTH

U.S. ARMY



MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY

JANUARY 1959 FLOOD PROFILE

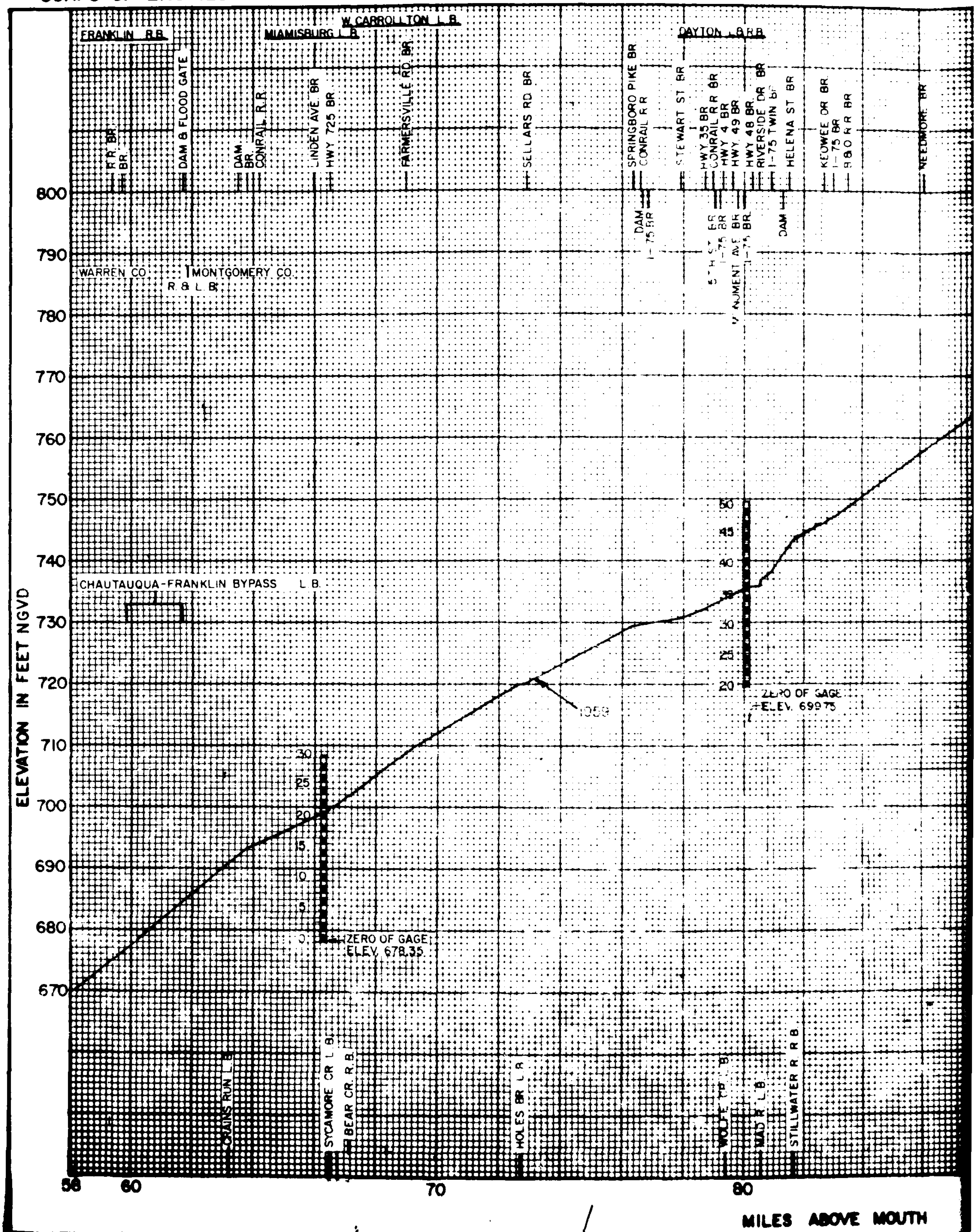
HOLES CREEK

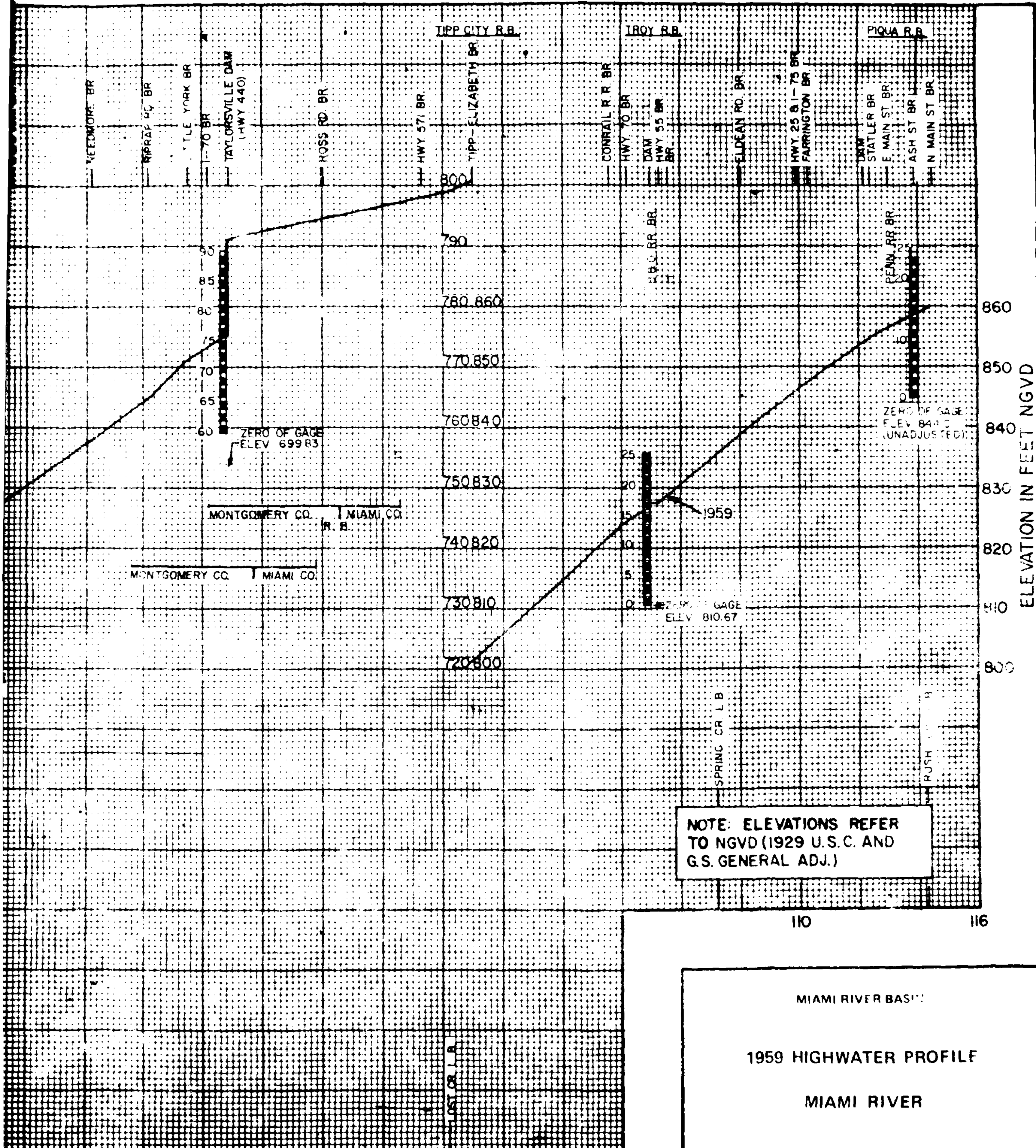
U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

ORLED–H

SEPTEMBER 1980

CORPS OF ENGINEERS





NOTE: ELEVATIONS REFER TO NGVD (1929 U.S.C. AND G.S. GENERAL ADJ.)

MIAMI RIVER BASIN

1959 HIGHWATER PROFILE

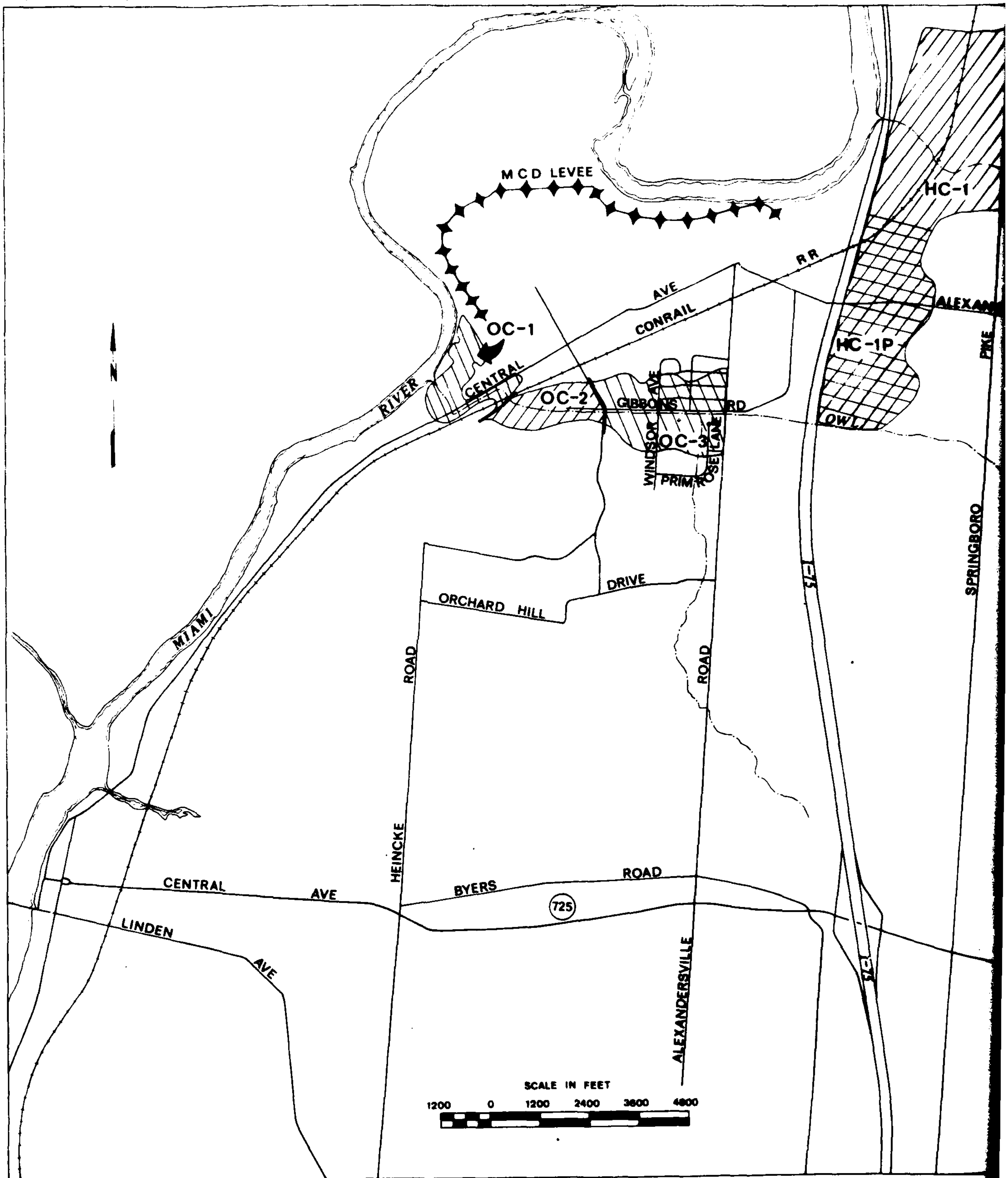
MIAMI RIVER

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.

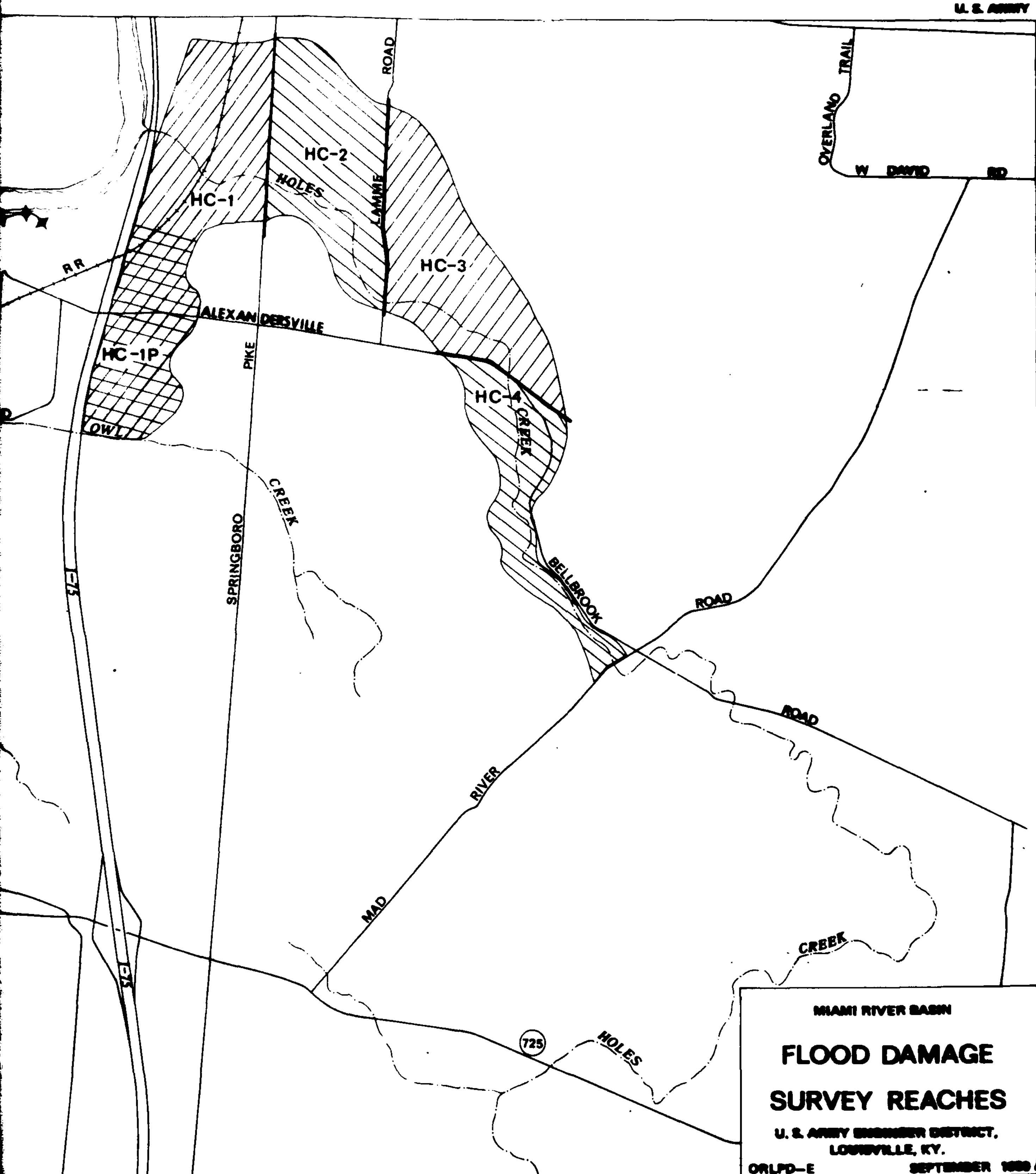
ORLED H

SEPTEMBER 1980

...VE MOUTH



M C D LEVEE
OC-1
OC-2
OC-3
HC-1
HC-1P
N
RR
AVE
CONRAIL
CENTRAL
RIVER
MIAMI
GIBBONS
RD
WINDSOR
AVE
ROSE
LANE
PRIM
OWL
ALEXAN
PIKE
SPRINGBORO
I-75
ORCHARD HILL
DRIVE
ROAD
HEINCKE
ROAD
CENTRAL
AVE
BYERS
ROAD
725
LINDEN
AVE
ALEXANDERSVILLE
SCALE IN FEET
1200
0
1200
2400
3600
4800



MIAMI RIVER BASIN

FLOOD DAMAGE SURVEY REACHES

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

ORLPD-E

SEPTEMBER [illegible]

APPENDIX A ADDENDUM A-1

PROPOSED HIGHWAY I-675

The purpose of this addendum is to provide additional discussion of the impacts on growth within Holes Creek drainage area due to the proposed I-675. This proposed circumferential highway would alleviate the problem of traffic bottlenecks on adjacent roads, especially during rush hours and facilitate leisure travel within the county. However, its main impact would be felt more as a convenient alternative in terms of motorist time and energy consumption than a significant contributor to population and economic growth in the drainage area. As a result of contacts with residents, business spokespersons, and planners in the area, the proposed highway, while desirable, does not provide the difference between living, working and doing business in this area and another area to a significant extent. The main reason the road will not induce substantial growth is that the area is presently growing at a rapid rate, and the I-675 corridor area will essentially be developed prior to construction of the highway. Also, due to this very growth, considerable opposition to construction of I-675 can be expected, as new homes and businesses are occupying the previously vacant strip planned for the highway construction.

APPENDIX A ADDENDUM A-2

POPULATION PROJECTIONS

The purpose of this addendum is to provide additional information to support the use of MVRPC projections rather than OBERS.

Original projections of the MVRPC were made about the time OBERS projections in Series E were made, but since then the MVRPC projections have been subject to updating and the most recent estimates are those on page A-33 in the report. The accuracy of the MVRPC population projections for Montgomery County, Ohio, is supported by the 1980 census. The population of Montgomery County was projected to be 569,400 in 1980, and the 1980 census sources indicated that this population is 567,149. Thus, this projection by the MVRPC was 99.6 percent accurate. In comparison, the disaggregated 1980 Montgomery County population, according to OBERS projections, for the BEA, is 661,856 which missed the 1980 census estimate by 94,662, or 16.7 percent. Further, OBERS projections for the eight-county BEA, relative to 1980, missed the 1980 census estimates and recent U. S. Department of Commerce estimates by about 21 percent. While census sources indicate that the population of the eight-county area is about 1,053,287 in 1980, OBERS projections for the area are 1,272,800. Although the population of the BEA has declined substantially since 1970, OBERS projected a substantial increase. Based on OBERS BEA projections, the disaggregated population projections for Montgomery County are 661,856 in 1980; 694,512 in 1985; 728,780 in 1990; and 783,952 in the year 2000, which are substantially higher than those of the MVRPC.

Projections of the MVRPC (Page A-33 in the report) take into consideration data indicative of intercounty and intracounty population movements relative to housing development, vacancy rates, demolition, zoning, and business location and relocation, in addition to fertility and death rates. Thus, the MVRPC, which has planners constantly operating in the field, is in a position to measure population trends in counties or parts thereof fairly accurately.

It is estimated that the population in the flood plain would not be significantly different between the without and with project conditions. The following table shows population projections for the flood plain of Holes Creek.

HOLES CREEK FLOOD PLAIN 1/
POPULATION PROJECTIONS 2/ (1979-2000)
WITH AND WITHOUT PROJECT
WEST CARROLLTON, OHIO

Item	1979	1985	1990	2000
Existing Development	2,400	2,400	2,400	2,400
Future Development 3/	0	1,500	1,500	1,500
Total	2,400	3,900	3,900	3,900

1/ Below elevation of 1,000-year present natural flood.
2/ Made by Louisville District personnel by multiplying residential units by estimated number of occupants per unit.
3/ Sites 1 and 2 (see Figure E-1, Page E-31).

APPENDIX B

FORMULATION, ASSESSMENT AND EVALUATION OF DETAILED PLANS

APPENDIX B

FORMULATION, ASSESSMENT AND EVALUATION OF DETAILED PLANS

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

TABLES

Table of Contents (Continued)

PLATES

Appendix B

Formulation, Assessment And Evaluation of Detailed Plans

The purpose of this appendix is to provide the criteria utilized in the formulation process and to provide a logical presentation of the procedure followed to plan selection. This latter procedure evolves sequentially from initial screening of possible alternative solutions, to further consideration of worthwhile plan components, and to impact assessment and evaluation of detailed plans. Emphasis is given throughout the process to retaining those plan components that realistically represent solutions available for public choice.

Plan Formulation

The array of possible flood control measures and plans can be divided into two general categories. Measures to modify damage susceptibility are those that modify, move, or restrict structures in the flood plain. These measures are generally referred to as nonstructural as they do not involve major construction undertakings. The other category consists of structural measures which either reduce the flood stage or physically limit the areal coverage of the flood. These measures involve the construction of levees, channel improvements, retarding structures, multipurpose reservoirs, or combinations. Detailed cost estimates for the feasible nonstructural and structural alternatives are presented in Appendix E. The measures and plans considered are discussed below.

Plan Formulation Rationale

The process of plan formulation is conducted with the goal of developing plans that meet the stated objectives. However, in order to formulate plans that can be implemented, the formulation process considers certain criteria. The cumulative consideration of these criteria is the rationale for formulating plans. The major criteria are provided below:

The plans must be acceptable to the public.

The plans must be able to function reliably and consistently in meeting the objectives.

The plans should furnish high degree of protection and not develop residual conditions which may cause adverse impacts to the health and lives of the affected public.

The plans should be equitable in the distribution of benefits and any disadvantages.

The plans must show that combined beneficial NED and EQ effects outweigh combined adverse NED and EQ effects.

The plans must not seriously degrade nor destroy valuable environmental or cultural resources.

Screening Studies

The primary desire of local interests within the study area is relief from flooding. Increased urbanization has resulted in increased flooding and flood damages even with stricter zoning ordinances. Increased development in upstream reaches, which will further compound the problem, is inevitable. In the formulation of plans, it was necessary to identify the realistic alternatives available to address the planning objectives, and to screen those alternatives to identify the one best responding to the planning objectives.

NONSTRUCTURAL MEASURES

The commitment to nonstructural alternatives has been addressed by both the President in his Executive Order 11988 and by Congress in the formal legislation of the Disaster Protection Act of 1973 and the Water Resources Development Act of 1974. The 1973 legislation took a significant step toward the implementation of the nonstructural approach by encouraging and requiring the purchase of flood insurance and by requiring the use of land regulation controls for the purpose of flood damage reduction. The 1974 Act called for

controls for the purpose of flood damage reduction. The 1974 Act called for the explicit consideration of nonstructural measures in Federal Water Resource Planning. Section 73(a) of this Act requires that, "In the survey, planning, or design by any Federal agency of any project involving flood protection, consideration shall be given to nonstructural alternatives to prevent or reduce flood damages including, but not limited to, flood proofing of structures; flood plain regulation acquisition of flood plain lands for recreation, fish and wildlife, and other public purposes; and relocation with a view toward formulating the most economically, socially, and environmentally acceptable means of reducing or preventing flood damages."

Measures which are designed to control flood waters--reservoirs, levees, channel modifications and diversions--protect both existing and future flood plain development. For nonstructural measures, however, some measures are designed principally for existing structures, and some principally for preventing future growth in flood damages. The screening study considered the following nonstructural measures.

Raise-in-Place. The theory of the alternative is that major damages begin to occur to structural units and their contents as floodwaters reach and exceed the first flood elevation whether the structure has a basement or not. By raising the structure (first floor) above the particular flood level, it would be possible to eliminate all or a great part of potential flood damages.

Evacuation of Flood Prone Structures From Flood Plain. This alternative concerns flood damages to structures located in the flood plain which can be eliminated by acquisition of flood prone properties, assisting the residents in finding safe and decent housing and tearing down or otherwise removing all flood prone structures, and converting the flood prone areas to uses more compatible with the risk of flooding.

Relocation of Flood Prone Structures out of the Flood Plain. The theory of this alternative is that, rather than destroy or dismantle for materials, those structures located in the flood plain and subject to flooding, consideration be given to moving or relocating such units out of flood prone areas. Some units may be located within the flood plain but relocated above pertinent flood levels.

Installation of Flood Proof Closures. Structures with exterior walls constructed of brick, brick veneer, concrete, and cement block are relatively impermeable and can be made more so by sealing exterior surfaces. Similarly, basement walls are usually of concrete or cement block and basement floors of concrete and therefore relatively impermeable. Structures of these types of materials are particularly suited to keeping out water and the only adjustments necessary are to minimize seepage through walls and floors with sealants and temporarily or permanently closing doorways and windows. Structures such as wood, aluminum, sheet metal, or masonite on either a wood or steel frame are generally permeable and difficult to keep water out. Similarly, structures on raised foundations with wood flooring are much more permeable than concrete slab-on-grade.

Construction of Small Walls and/or Levees around Structures. Individual walls and/or levees are not considered feasible for residential protection due to the great number of structures involved--about 525 at the 100-year level.

Relocation or Protection of Damageable Property within an Existing Structure. Since significant damages are a result of basement flooding, consideration was given to relocating the major items normally found in the basement and subject to damage. Those items include the heating-air-conditioning equipment, water heater, and laundry facilities. A preliminary evaluation of space requirements for the facilities to be relocated indicated that few, if any, houses could accommodate such a relocation. In many cases, the type of furnace utilized in a basement installation is completely different from that used in a ground flood installation and would require extensive modification

or replacement to effect a relocation. The water heater and laundry facilities would not pose such significant problems but would require revised plumbing connections for the hot, cold, and drain piping and the dryer vent. No further consideration was given to this alternative.

Control of Flood Plain Development. Restriction of development in the flood plain is necessary to curtail the growth of damageable property in the flood plain. Various methods of control are available to the community planners such as zoning ordinances, subdivision regulations, and building codes. Zoning ordinances regarding flood plain development are a requirement of the Flood Insurance Program. Zoning ordinances, whether a part of the Flood Insurance Program or not, provide a means of prohibiting, limiting, or controlling residential, commercial, and industrial development in or near the flood plain with the view to minimizing potential flood damages. Subdivision regulations are aimed specifically at one major type of development that, due to a scarcity of other suitable land, often finds its way into the flood prone areas. Subdivision regulations, combined with building code requirements calling for damage-resistant materials, offer significant opportunities for both the city and county zoning commissions to reduce future flood damages by restricting development. Additional discussion concerning zoning provisions required by the Flood Insurance Program is presented under that heading.

In the case of West Carrollton and the Holes Creek and Owl Creek Basins, development of the flood plain is considered essentially complete and little additional development is expected. Redevelopment, due to changing land uses and/or property values, points out the need to review existing zoning ordinances, subdivision regulations, and/or building codes for the purpose of minimizing future flood damages.

Costs associated with implementing zoning ordinances, subdivision regulations, and building codes include costs for obtaining basic engineering data, for drafting and adopting a regulation and possible loss of tax revenue. Loss of tax revenue would result from the prohibition of use or limitation of use of areas in the flood plain.

Utilization of these procedures is seen as an alternative that can be implemented by local authorities. No further consideration is given with the exception of the Flood Insurance Program requirements.

Flood Forecasting, Flood Warning, and Evacuation System. Flood forecasting, flood warning, and flood evacuation are strategies to respond to a flood threat. These strategies include the following:

A system for early recognition and evaluation of potential floods,
Procedures for issurance and dissemination of a flood warning,
Arrangements for temporary evacuation of people and property,
Provisions for installation of temporary protective measures,
A means to maintain vital service,
A plan for post-flood reoccupation and economic recovery of the flooded area.

Systems for early recognition and evaluation of potential floods are generally of two types: those for flooding of major stream systems and those related to flash floods. The National Weather Service (NWS) has 13 river forecasting centers and 82 river district offices located throughout the United States. Generally, their forecasts predict stages on major river systems such as the Miami River and would be valuable in alerting property owners and residents to the threat of backwater flooding along the river.

Headwater flooding in the Holes Creek and Owl Creek Basins, however, are more of the flash flood variety as noted by the relatively short time of concentration for the two streams - 1.1 to 1.6 hours for Owl Creek and 6.2 to 7.1 hours for Holes Creek. Flash flood systems are of different types. These include:

Self-contained community or county forecasting systems,
Automatic flash flood alarm systems,
National Weather Service forecasting charts,
Weather warning broadcasts,
Manual observations.

Flood warning is the critical link between forecasts and response. An effective warning process will communicate the current and projected flood threat, reach all persons affected, account for the activities of the community at the time of the threat (day, night, weekday, weekend), and motivate persons to action.

An effective warning needs to be followed by an effective response. This means effective and orderly evacuation of people and property. Actions which can facilitate this include:

Establishment of rescue, medical, and fire squads,
Identification of rescue and emergency equipment which can be utilized during a flood,
Surveillance of evacuation to insure safety and protect property.

In addition to evacuation, property can be protected by various protection measures. These include: temporary flood proofing of structures discussed previously, use of pumps, and flood fighting. Flood fighting includes such actions as raising the level of existing protection; closing highways, streets, and railroads; prevention of backwater in sewers; and protection against erosion. All of these actions contribute to the overall goal of reducing flood loss.

A forecast, warning, and evacuation strategy will include maintenance and management of vital services before, during, and after the flood and post-flood reoccupation and recovery. Vital services include telephone, energy (gas and electric), sewage, water, traffic control, hospitals, as well as police and fire services.

The factors which determine the physical feasibility of forecast, warning, and evacuation measures are somewhat different from those which determine the physical feasibility of many other nonstructural measures. The feasibility of most other measures is directly related to the type structure and

depth of flooding. Forecast, warning, and evacuation feasibility are more dependent upon hydrologic, social, and institutional factors. The selection and feasibibility of forecasting capability depends upon the size of the drainage area; whether the river is a main stem or tributary; travel time; and other hydrologic factors which influence the ability to make reliable forecasts. Small watersheds generally have short response times, making it especially difficult for warning to be helpful. Such is the case with the Holes Creek and Owl Creek Basins.

Tax Incentives. Tax incentives can be used as a measure to control flood loss damages in two ways. By the use of a tax reduction, an owner may be encouraged to preserve the flood plain, to provide open space, preserve agricultural lands, and meet other objectives as part of the community's planning goals. Also, tax surcharges may be utilized to influence a development pattern by making flood plain lands and their subsequent urbanization economically unattractive. Several states now have specifically authorized tax incentives for open space use.

Use of the tax incentive as an alternative is made difficult by its very nature, that being a levy. In most cases, such incentives must be approved by a referendum and this, combined with the political ramifications of a tax proposal and the disfavor of taxation with the general public, makes the widespread application of this measure unlikely.

No dollar values can be assigned to this measure and, therefore, no benefit-to-cost ratio can be obtained.

Flood Insurance. Flood insurance is unique among all other measures considered in that it does not directly reduce flood damage to either existing or future development, but rather indemnifies a policy holder for financial losses suffered during a flood.

Federally subsidized flood insurance with a Government subsidy of up to 90 percent was made available for existing flood plain uses by the National Flood Insurance Act of 1968. The Act required that communities adopt land use controls meeting the Department of Housing and Urban Development (HUD) standards as a prerequisite for subsidized insurance. The original Act provided that such insurance was to be made available only after actuarial premium rates had been determined for a community. Actuarial rates were to be established by the Federal Insurance Administration (FIA) based upon an evaluation of an actual risk. A 1969 amendment to the Act established an emergency program whereby subsidized insurance could be made available to a community prior to establishment of actuarial premium rates.

As amended in 1969, the 1968 Act applies to mudslide as well as flood hazard areas. The 1973 Flood Disaster Protection Act extends the coverage to flood-related erosion areas, and substantially increases the ceiling for Federal subsidies.

The 1973 amendments materially changed the entire concept of the original program by making it virtually compulsory rather than voluntary. The Act provides that, within communities which have identified flood hazards, property owners eligible for flood insurance from FIA must purchase such insurance or lose eligibility for Federal assistance for construction and acquisition in the identified flood plain. This includes bank loans and mortgage insurance. Eventually, Federally subsidized flood insurance will not be available unless the community adopts land use regulations meeting FIA's standards.

Flood insurance is viewed as a measure which an individual property owner may use to "solve" a flood problem. It may be the preferred alternative--preferred over temporary closures, raise-in-place, relocation, or any other measures.

Flood insurance is available to all property owners in communities designated by the Federal Insurance Administration as participating communities in

accordance with the rules and regulations of the program. Insurance is available for both structure and contents. Property eligible for insurance has its limits as to the amount of coverage. These limits are not generally restrictive and most property can be adequately covered. In some situations, however, these limits may impose restrictions which limit the feasibility of insurance as a measure. As of March 1977, the average flood insurance policy was for $28,900 for a residential dwelling and $42,000 for other structures.

At the present time, there are two insurance rate schedules to establish the payable premium for flood insurance. These are the chargeable (subsidized) rates available under the Emergency Program and the risk premium (actuarial) rates available under the Regular Program. Chargeable rates are rates established by the FIA and involve a high degree of participation by the Federal Government to encourage the purchase of flood insurance. Chargeable rates are available under the Emergency Program for structures and contents outside the special flood hazard areas. Most premiums being paid today are based upon this chargeable rate. Insurance for maximum coverage of a single family dwelling in most states would cost $122.50 annually for structure and contents. This is approximately 0.41 percent of the value of the structure. The average premium per policy in the Flood Insurance Program as of March 1977 was $75.

In other portions of this report, economic feasibility was evaluated by comparing cost with damage reduced. In the case of flood insurance, damage is not reduced by taking out a policy; consequently, it is never economically feasible when evaluated in this way. Flood insurance, like fire insurance, is taken out for a variety of reasons, most of which are associated with risk and security. By paying a small premium, a property owner can be covered for a full range financial loss.

In other aspects, the Flood Insurance Program does reduce future flood damages. To participate in the Flood Insurance Program, the community must adopt land use and control measures such as zoning ordinances, subdivision

regulations, and/or building codes to comply with standards set forth for flood insurance programs (24 CFR 1910, Subpart A).

At the present time, a Flood Insurance Study is underway for West Carrollton, Ohio. A preliminary flood insurance report was distributed for review in October 1980; the review process is continuing. The final report is expected to be available in the fall of 1981. Since the proceedings for flood insurance are in progress, further consideration of flood insurance as a nonstructural alternative is not considered necessary.

STRUCTURAL MEASURES

Structural measures to reduce the frequency of flooding to existing improvements were considered for both Holes and Owl Creeks. The major areas of concern were the lower reaches of the streams where most damages occur. Alignments and quantity estimates are generally based on 7.5 minute quadrangle sheets data with some supplemental field notes.

Channel Improvement. Channel improvement usually involves widening and straightening in order to improve the hydraulic carrying capacity of the stream. Typically, channelization requires the construction of a trapezoidal channel. Usually all cover, obstacles, and irregularities within the stream are removed as well as streamside vegetation. The effect on associated terrestrial and aquatic wildlife is usually severe, often with little opportunity for recovery, particularly considering continued maintenance activities required for the channel and side slopes.

Channel improvement lowers flood heights and results in significant long-term flood damage reduction, increased property values, and enhance the security and general welfare of flood plain residents. Associated health problems experienced during flooding are either eliminated or reduced. Additionally, channel improvement would reduce the anxiety associated with unexpected flood occurrences and the inconveniences associated with temporary

disruption of employment, community services, transportation, utilities, and other community amenities and services. Channel modification would also reduce temporary isolation of residents during flooding.

Floodwalls and Levees. Floodwalls and levees preclude floodwaters from entering damage susceptible areas. Detrimental impacts associated with floodwalls and levees are similar to those associated with channel improvement except that streambank vegetation removal is usually avoided or greatly reduced, and most detrimental impacts on the natural environment are reduced. Borrow excavation for material to construct levees can induce adverse impacts, particularly if required impervious material can be found only in environmentally sensitive areas. Beneficial impacts associated with floodwalls and levees are also very similar to those of channelization except that they are usually intensified by the positive degree of protection provided by floodwalls and levees.

Reservoirs. Reservoirs reduce flood levels by holding back peak flood flows until downstream conditions permit release. They can also be effective in fulfulling a wide range of water resources needs such as providing recreational opportunities and providing storage for a number of uses in addition to flood control. However, unless the reservoir adequately controls a large portion of the drainage area above a damage center, the degree of protection provided could be low.

Floodwater Diversions. Diverting floodwaters away from damage centers can be a very effective measure as long as induced damages are not significant. Usually in order to be practical, the topography has to be conducive to relatively short and shallow diversion channels. Diversion channels usually leave the main streams and have environmental impacts similar to levee plans. When all flood flows are diverted, the plan reduces downstream flooding very similar to a reservoir.

CONCLUSIONS

Of the measures identified, some are clearly more responsive than others to the specified planning objectives for this study. To avoid development of less viable alternative plans and to keep those alternative plans evaluated in detail at a manageable number, those management measures considered to be clearly less responsive to the planning objectives were eliminated from further consideration. The measures eliminated from further consideration were building code regulations, temporary flood plain evacuation, permanent flood plain evacuation, and tax reform. In addition, no attempt was made to incorporate zoning or flood insurance in any alternative plans because these two measures were assumed to be a part of the "without" conditions. Thus, the measures of raise-in-place, flood proofing, channel improvements, floodwall and levees, reservoirs, and floodwater diversions remained for consideration in development of alternative plans.

Analysis of Preliminary Plans

In the early planning stages, a wide range of plans was considered for alleviating the flood problems. This section provides a brief description of each plan, a comparative assessment and evaluation of the plans, and concludes with identification of those plans to be studied further. General locations of the structural plans are shown on Plate B-1.

BRIEF DESCRIPTION OF PRELIMINARY PLANS

Raise-In-Place. This alternative would physically raise the first floor of houses to provide 100-year flood protection. For Holes and Owl Creeks, the residential units affected by the plans are 29 and 44, respectively. Although flooding, including the 100-year frequency flood, causes extensive damages and affects a relatively large area, the depth of flooding is not substantial. This characteristic applies to both creeks and the average height required for first floor protection is about 2 feet. As detailed investigation of each

house would be required to determine whether it could structurally be raised, it was assumed that all houses with a basement or crawl space could be raised. The plan was analyzed for each stream reach for both creeks.

Flood Proofing. This alternative would prevent water from entering structures up to a 100-year level of protection by installation of permanent and/or semipermanent closures and waterproofing measures. For Holes and Owl Creeks, the alternative would protect 272 and 173 houses, respectively. Permanent measures would be required, where possible, due to the quick rise of floodwaters. It was assumed that all houses could withstand the induced hydrostatic pressure. However, due to hydrostatic pressure, it was assumed that houses with basements which have large basement doors could not be protected by this plan. Plans were developed for each stream reach and for each stream as a unit.

Reservoirs. The drainage basins of both creeks were studied for potential reservoir sites. Due to urbanization and the absence of major tributaries, effective reservoir sites could not be located on either stream. A site on Holes Creek near Grant Park was considered initially, but due to relatively high cost, on the order of $9.5 million, and recent planned development in the area, the site was no longer a practical solution.

Right Bank Holes Creek Levee. For Holes Creek, a right bank levee plan was considered from Lamme Road, east of Stream Mile 1.0 to the Interstate 75 ramp embankment. The plan includes 3,480 feet of earth levee, 860 feet of concrete wall, one pumping plant, and other appurtenances. In order to avoid the relocation of several families and expensive land acquisition, about 1,500 feet of Holes Creek is realigned to provide adequate space for levee construction. The levee was designed to protect against the standard project flood. The plan would provide virtually complete protection to the residential and commercial development on the right bank between Lamme Road and Interstate 75.

Left Bank Holes Creek Levee. The left bank levee extends from high ground east of Springboro Pike to the Interstate 75 ramp embankment. The plan includes 3,010 feet of earth levee, 600 feet of concrete wall, one pumping plant, and other appurtenances. The levee was designed to protect against the standard project flood. The plan would provide virtually complete protection for all development on the left bank from Lamme Road to the Miami River.

Right Bank Owl Creek Floodwall. Due to extensive development along Owl Creek from just upstream of Conrail Railroad to Alex Road, the construction of levees was deemed unpractical. A concrete wall along Gibbons Road was considered during screening studies. The wall would protect the residential and commercial development on the right bank from Alexandersville Road to Conrail Railroad Bridge. The wall would average about 7 feet high and would have a length of 4,500 feet.

Allen Plat Levee And Wall. This plan would protect the area, Allen Plat, lying between Central Avenue and the Miami River on the right bank of Owl Creek. As the area is subject to flooding from the Miami River and Owl Creek, an earth levee begins at the MCD levee for West Carrollton and continues downstream along the Miami River to Owl Creek and then along the right bank of Owl Creek to Central Avenue. A concrete wall would then follow along the north side of Central Avenue to high ground. The total plan would consist of 1,300 feet of earth levee, 1,500 feet of concrete wall, one pumping plant, and other appurtenances.

Owl Creek Channel Improvement. The plan would improve the channel from Alexandersville Road to the Conrail Railroad Bridge. The improvement was considered for 25-year and 10-year levels of protection. For both levels of protection, the plan consists of 4,500 feet of channel enlargement.

Holes Creek Channel Improvement. This alternative for Holes Creek has the purpose of furnishing protection for all development from Lamme Road to the Conrail Railroad. By changing the flow area provided, a variety of

options in respect to degree of protection can be provided by this alternative. Studies were conducted for improved channel sizes ranging from control of a 25-year flood to a 500-year flood. The length of improvement would vary from 5,700 feet for the 25-year plan to 7,550 feet for the 500-year plan.

Owl Creek Interbasin Diversion Plan. A diversion plan to convey water from the natural ponding area on the right overbank of Owl Creek upstream of Interstate 75 to Holes Creek just upstream of Conrail Railroad was considered. A preliminary hydraulic analysis indicated that the plan would have little impact on flood conditions on lower Owl Creek and would provide protection to the ponding area only for Owl Creek floods. The area would still be subject to flooding (although less frequently) from Holes Creek and the Miami River. The plan consists of about 6,000 feet of open earth channel.

Holes Creek Interbasin Diversion Plan. The best opportunity for diverting floodwaters from Holes Creek to another drainage system is in the upper Holes Creek watershed. The diversion channel would extend from Holes Creek just upstream of State Road 725 southwesterly along unnamed tributaries to the Miami River. The diversion would control about one-third of the drainage basin and would consist of about 3.5 miles of excavated channel, two pipeline modifications, four highway drainage structures, and a maximum cut of 55 feet.

COMPARATIVE ASSESSMENT AND EVALUATION OF PRELIMINARY PLANS

The previous paragraphs presented a brief review of each plan considered in the preliminary planning stage. These plans were then compared and evaluated in order to screen out the unproductive plans. The criteria used in the screening process generally relate to meeting the planning objective. Values used for comparability and evaluation purposes included: total first cost, benefit-cost ratio, flood damage reduction, residual damages, public acceptability, and pertinent remarks. Table B-1 presents a summary of the results of the comparative assessment and evaluation of plans. It provides the basis for selecting those plans which best meet the planning objective. Plate B-1 illustrates the general location and alignment of the considered plans.

TABLE B-1

EVALUATION OF PRELIMINARY PLANS

Alternative-Plans (Total Est. First Cost)	Economic Feasibility	Damage Reduction	Remaining Damages	Public Views and/or Remarks
Holes Creek Reservoir ($9,500,000)	Unfeasible - Not quantified, but cost exceeds potential benefits	Not quantified; Appears 50% or less	Not quantified; Appears 50% or greater	Extensive development in considered pool area
Right Bank Holes Creek Levee ($4,400,000)	Feasible - 1.3 B/C	67%	$225,000	Public prefer ch. Imp.
Left Bank Holes Creek Levee ($2,230,000)	Unfeasible - 0.8 B/C	25%	492,000	
Right Bank Owl Creek Wall ($2,150,000)	Unfeasible - 0.5 B/C	40%	141,000	
Allen Plat Levee and Wall ($1,650,000)	Unfeasible - 0.4 B/C	27%	170,000	
Holes Creek Channel Imp.				
25-Year Plan ($3,760,000)	Feasible - 2.0 B/C	84%	108,000	Public prefer higher degree of protection
100-Year Plan ($6,050,000)	Feasible - 1.3 B/C	88%	81,000	Acceptable
500-Year Plan ($6,430,000)	Feasible - 1.3 B/C	90%	70,000	Acceptable
Owl Creek Channel Imp.				
10-Year Plan ($2,500,000)	Unfeasible - 0.5 B/C	42%	135,000	
25-Year ($2,810,000)	Unfeasible - 0.5 B/C	44%	130,000	
Holes Creek Interbasin Diversion ($9,000,000)	Unfeasible - Not quantified, but cost exceeds potential benefits	Not quantified; Appears less than 50%	Not quantified; Appears greater than 50%	High cost due to length and required structures
Owl Creek Interbasin Diversion ($540,000)	Unfeasible - Not quantified, but cost exceeds potential benefits	Not quantified	Not quantified	

TABLE B-1 (Continued)

Alternative-Plans (Total Est. First Cost)	Economic Feasibility	Damage Reduction	Remaining Damages	Public Views and/or Remarks
Raise-in-Place - Holes Creek ($480,000)	Feasible - 1.2 B/C	7%	$609,000	Not effective; Not acceptable to local sponsor
Raise-in-Place - Owl Creek ($304,000)	Unfeasible - 0.9 B/C	9%	212,000	Not effective; Not acceptable to local sponsor
Flood Proofing - Holes Creek ($1,640,000)	Feasible - 3.2 B/C	55%	304,000	Not acceptable to local sponsor
Flood Proofing - Owl Creek ($1,090,000)	Feasible - 1.7 B/C	58%	97,000	Not acceptable to local sponsor

AD-A113 101 ARMY ENGINEER DISTRICT LOUISVILLE KY F/G 13/2

HOLES CREEK, WATER RESOURCES DEVELOPMENT. VOLUME 2. APPENDICES.(U)

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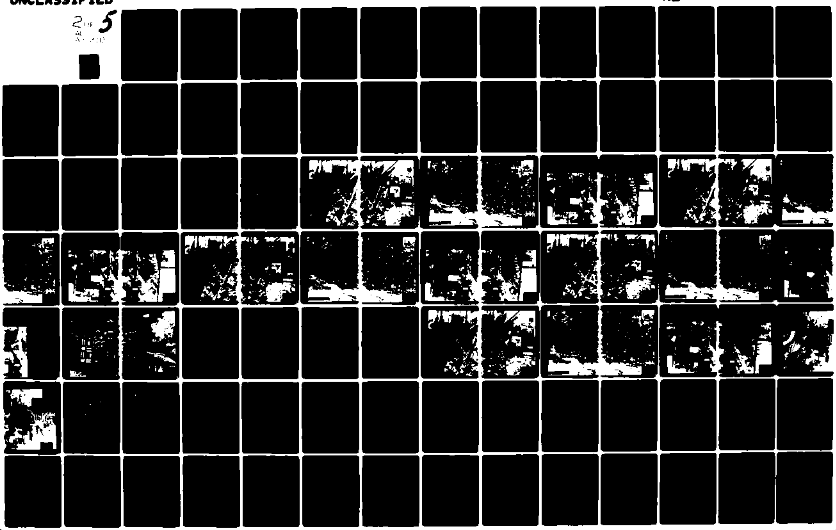

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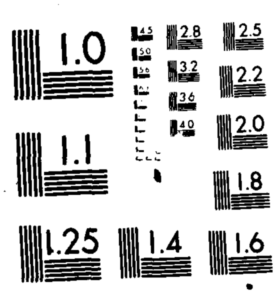

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CONCLUSIONS

The data in Table B-1 provide sufficient justification for eliminating several of the preliminary plans. For Owl Creek, the only economically feasible plan is the flood proofing plan. However, as the local sponsor has shown no support for this plan (Exhibit 4 of Appendix C), the plan was given no further consideration. A review of Table B-1 for Holes Creek shows three alternatives warranting further studies. The alternatives are the channel improvement, right bank levee, and the nonstructural plans. However, a variety of channel sizes was considered for the channel improvement alternative. These design sizes provided protection against flood levels ranging from a 25-year flood to a 500-year flood. Economic evaluation (see Appendix E) of this range of channel designs resulted in the plan providing 25-year degree of protection having the greatest net benefits and the plan providing 500-year degree of protection furnishing the highest protection while remaining economically viable. These two channel improvement plans are included in the detailed analysis of plans. Although a nonstructural plan is not desired by local interests, the flood proofing plan is considered further as an alternative to the viable structural plans in conformance with the President's water policy contained in his Message to Congress on 6 June 1978.

A conceptual recreation plan was developed in association with the channel improvement alternative. This plan is for a community type park to be used by the adjacent neighborhood. The main recreational activities are expected to be walking, jogging, bicycling, outdoor games, and picnicking. With minor modification, the plan could be adapted to the levee plan. The recreation plan is discussed further under Plan Selection of this Appendix and is evaluated under Appendix E.

COMBINATIONS

Combining different plans or plan elements can at times result in the best overall plan for water resource development. However, each plan or plan element has to be feasible in order to be included in a comprehensive plan. Because of this policy, the combination of the left bank and right bank levees

in order to provide SPF protection for the area, even if the combination is feasible, is not acceptable. The combination of levees for Owl Creek and Holes Creek to prevent flooding of Reaches HC-1 left bank and HC-1P is not economically feasible. As the left bank levee for Holes Creek is economically infeasible, and would remain so even if all potential benefits in HC-1P were claimed, the combining with a levee on Owl Creek would result in an unacceptable plan. Also, the flood proofing plan was not combined with any structural plans, due to the general opposition to nonstructural plans. The combination of levees and channel improvements would be possible. The combination of the right bank levee and the 25-year channel improvement plan would be one possibility. By combining these two, the left bank area would receive 25-year flood protection and the levee height could be reduced for providing SPF protection on the right bank. However, certain cost items for the levee (such as the pumping plant, basic right-of-way, and 3 feet of freeboard) would remain almost unchanged. Although the plan was not analyzed in detail, the first cost would be on the order of $6-3/4 million and the plan would be marginally feasible. This combination plan was considered no further as other plans are available that result in equitable protection, high degree of protection for both banks, and more cost effective.

Assessment and Evaluation of Detailed Plans

The previous section identified the plans warranting detailed studies. This section will furnish the description, impact assessment, and evaluation for each of the four plans studied in detail. For clarity during further discussions of these plans, the flood proofing plan, levee plan, 25-year channel improvement plan, and 500-year channel improvement plan have been designated Plans A, B, C, and D, respectively.

Description of Detailed Plans

PLAN A

The flood proofing alternative for Holes Creek is designed to prevent floodwaters from entering structures up to the 100-year flood level. This can be accomplished by installation of permanent and/or semipermanent closures for various openings, installation of a sewer gate valve and water proofing the exterior either by special coating or by construction of a new exterior cutoff wall (masonry) in the case of frame structures. Indications are that flood proofing should be limited to a maximum height of 3 feet to prevent induced structural damage from excessive hydrostatic pressures.

The plan would require the property owner's presence for installation or placement of closures during the less frequent more severe flood events. The relatively short time of concentration of floodwaters would necessitate the above. Also, a flood proofed structure may be isolated at the peak of flooding which would pose a particular threat in case of an additional emergency.

Flood proofing was assumed to be applicable to all categories of flooding such as basement only, structure only, and combination basement-structure flooding. The principal exception would be that flood proofing techniques are not seen as applicable to basement garage door openings due to the hydrostatic pressure on such an expanse and size, strength, cost, and installation time factors for such a flood proofing closure. Assuming one-third of those units suffering basement flooding at the 100-year level would not be candidates for flood proofing, 272 out of 305 total units could be flood proofed.

As this plan was the least damaging to the environment, it was selected for modifications to become a plan that not only meets the planning objectives (at least to a degree) but also enhances the environment. The acquisition of about 24 acres (see Plate B-2) of stream and wooded habitat is included in the plan. The preservation of this habitat, which is threatened by its urban surroundings, provides positive environment quality impacts.

While the above appears on paper to offer a workable solution, the specific impacts of implementation and the necessity of detailed site-specific

information for each structure make the foregoing only an estimate of capability. Highly detailed information required to fully evaluate the alternative is not available at this time. In addition, local officials and property owners in the flood plain have voiced their opposition to nonstructural measures particularly in view of feasible structural plans discussed elsewhere in this report.

PLAN B

The Plan B levee would start at high ground just east of Lamme Road and extend westward along an existing drainage ditch to Holes Creek where it would follow the right bank of Holes Creek to its terminus at the Interstate 75 ramp (East Dixie Drive) embankment. The plan would provide Standard Project Flood protection to the right overbank from Lamme Road to Interstate 75 ramp (East Dixie Drive). The main features of the plan consist of 3,480 feet of earth levee, 860 feet of concrete wall, one pumping plant to handle interior drainage, 1,500 feet of channel realignment, and a sandbag closure on Lamme Road. The channel realignment is necessary to provide adequate space between the channel and existing homes for levee construction. Plan B is shown on Plate B-3.

The levee would have a 12-foot crown width and 3 horizontal to 1 vertical side slopes. The slopes, crown, and contiguous construction areas would be seeded in a durable grass. Approximately 55,000 cubic yards of materials would be needed for construction of the earth levee. The borrow site would be graded and seeded and returned to private owners for future use.

The concrete wall section of the plan extends east and west of Springboro Pike and was necessary in order to reduce social and economical impacts that would have resulted with an earth levee from the purchase of several homes and the business losses to a commercial establishment west of Springboro Pike. Alteration of local drainage patterns would be necessary for levee construction and for conveying interior runoff to the pump plant. A sandbag closure would be necessary for Lamme Road, but no closure would be necessary at Springboro Pike due to high ground.

The channel realignment would not constitute a long-term improvement in flow efficiency, but would serve only to establish a feasible levee alignment. Most of the excavated material would be used to fill the old channel.

The plan also preserves about 1 acre of wildlife habitat as a wildlife mitigation measure.

PLAN C

Plan C is a channel improvement plan that would provide a 25-year degree of protection for existing development from Lamme Road to the Interstate 75 ramp (East Dixie Drive). The improved channel would start at the above identified ramp and extend upstream to Lamme Road in order to provide full protection for the areas receiving the highest damages. The total length of improvement is about 5,700 feet and the plan is shown on Plate B-4. Design details are shown in Table B-2. The channel is trapezoidal with 3 horizontal to 1 vertical where riprapped and 6 horizontal to 1 vertical where seeded. The exception to the trapezoidal design is the first 1,200 feet downstream of Lamme Road where the only improvement is the shaping and riprapping of the left bank to 3 horizontal to 1 vertical. The plan includes replacement of the Conrail Railroad Bridge and the taking of three commercial structures. Modification of slopes for the Springboro Pike bridge would also be required. A disposal site for about 60,000 cubic yards of material has not been specifically identified, but for estimating purposes, the gravel borrow pits on the west bank of Miami River were assumed to be suitable. The plan includes the preservation of a woodlot of about 4 acres.

PLAN D

Plan D is a channel improvement plan similar to Plan C. Plan D would provide a 500-year degree of protection for existing development from Lamme Road to the Conrail Railroad. Below Conrail, the Miami River backwater from a 500-year frequency flood would inundate the flood plain. The improved channel

would start at the Interstate 75 northbound bridge and continue about 1,000 feet upstream of Lamme Road. The total length of improvement is about 7,550 feet and the plan is shown on Plate B-5. Design details are shown in Table B-2. The plan includes replacement of the Conrail Bridge and the taking of three commercial structures. Modifications of the Springboro Pike Bridge are also included. The disposal of excavated material is to be accomplished as discussed for Plan C.

This plan has included design features to reduce adverse environmental impacts. These features include leaving one bank in its natural state (or reconstructing to appear natural, where necessary) for approximately 3,800 feet and constructing a low flow channel with ripples and pools. It also includes the preservation of a woodlot of about 4 acres. Typical sections and illustrations for these features are shown on Plates B-6 and B-7. Other design details are shown on Plate B-8.

TABLE B-2

DESIGN FEATURES FOR CHANNEL IMPROVEMENT PLANS C & D

Channel Improvement Plan 1/	Interstate 75 Northbound to East Dixie Highway	East Dixie Highway to Conrail Railroad Bridge	Conrail Railroad to Springboro Pike	Springboro Pike to Lamme Road	Lamme Road to About 1,000 Feet Upstream
PLAN C 25-Year Plan	No improvement	About 500 feet; 60-foot bottom width; 3:1 rip-rap slopes	About 1,400 feet; 90-foot bottom width; 3:1 rip-rap slopes	About 2,600 feet; 110-foot bottom width; 6:1 grass slopes; and about 1,200 feet of 3:1 riprap slopes for left bank only.	No improvement
PLAN D 500-Year Plan	About 800 feet; 60-foot bottom width; 3:1 rip-rap slopes	About 500 feet; bottom widths vary from 100 to 160'; 3:1 riprap slopes	About 1,400 feet; bottom widths vary from 144' to 200'; side slopes vary from 3:1 riprap to vertical concrete	About 3,800 feet; bottom widths vary from 110' to 165' (avg. 142'); left bank slope @ 6:1 and grass; right bank slopes remains as is.	About 1,000'; average 90' bottom width gabions on left bank 3:1 riprap right bank

1/ Transitions and bridges are included in identified segments.

Impact Assessment and Evaluation of Detailed Plans

The four plans warranting detailed consideration have been identified and described. A discussion of the impacts associated with these plans and an evaluation of the impacts are provided below. The information is furnished in respect to natural resources and cultural and social resources. Impact assessment and evaluation for economic factors are presented in Appendix E.

NATURAL RESOURCES - CHANNEL IMPROVEMENT PLANS

As channel improvement plans would have similar impacts, the impacts and evaluations are discussed for the alternative, except where differences are noted.

Soils, Erosion, and Streambank Effects. The channel improvement alternative for flood alleviation along Holes Creek will have both adverse and beneficial impacts concerning soils, erosion, and streambank effects. Adverse impacts will include short-term erosion during construction due to open exposure and disturbance of soil. This erosion will result in sediment accumulations to the creek and will continue until vegetation is reestablished and soils are stabilized in the area.

Beneficial impacts from reduced flooding will entail reduced erosion and scouring of the flood plain with associated lesser destruction of streambanks and adjoining lands. Side slopes of the new channel, where effected, will be seeded or riprapped to minimize future streambank erosion and reduce sediment accumulations to the creek.

Air Quality. Implementation of this alternative will result in an increased suspended particulate level to the area as fugitive dust from construction activities and from wind erosion of the disturbed soils. This condition will persist only during the construction phase as a short-term

effect and will not have any long-term implications to the air quality of the area. There will be minor emissions of gaseous pollutants (hydrocarbons, carbon monoxide, nitrogen dioxide, and sulfur dioxide) from construction-related activities (i.e., vehicle traffic, earthmoving equipment, etc.). Here again, these emissions will only occur over a short period of time.

Water Quality. Construction of the project will result in both short- and long-term changes to water quality. These changes will occur from increased suspended sediment, water velocity, and effects to substrate. Increased turbidity as a short-term impact will result from higher suspended and dissolved solids within the stream. This is caused from disrupted soils during construction and subsequent erosion. Impact of the increased sediment load to Holes Creek will extend into the Miami River for a distance downstream of the confluence point. Removal of shade trees as a result of the project will focus as a long-term increase to water temperature with the impacts of the plans being about the same.

Noise Levels. A short-term increase in noise levels in the study area due to construction activities will occur. This will cause a temporary inconvenience to area residents. No long-term impacts are anticipated and no changes in noise levels from existing sources are expected.

Vegetation. A significant adverse impact from the considered channel improvement plan will occur from the clearing and grubbing of the construction area. This will infringe upon woodlot, old and new cultivated fields, in addition to riparian flood plain areas, and will involve removal of trees and associated communities; some communities being in stages of secondary development (succession). However, both plans preserve a woodlot of about 4 acres. Acquisition of the woodlot will assure the continued existence of this relatively valuable community. Upon construction completion, selective planting or riprapping of the streambanks will minimize short- and potential long-term erosion problems. Disposal of material could impact existing plant communities. Other effects will involve the disruption of vegetated areas

from relocation of utilities (e.g., water main and sanitary sewerlines, etc.). All areas disturbed by construction will be seeded as soon as practical.

Wildlife. Alteration of vegetation and corresponding habitat will cause displacement of terrestrial wildlife from within this area. This focuses as an adverse impact of this plan. During construction, activities causing noise, dust, etc., will cause a short-lived increase in wildlife mobility. After construction, it is anticipated though that this will revert and again reach potential equilibrium. To minimize habitat disruption impacts from construction, the disturbed areas will be seeded. This, though, shall alter species diversity and effectively create new habitats from the changing of e.g., species feeding, breeding, and migrating habits. Disposal of generated spoil material will result in habitat burial and some wildlife displacement. Yet if properly vegetated to curb runoff sediment and airborne dust problems, this disposal area could suffice to establish new habitat for some small animal species. An additional adverse effect will result from water main and sanitary sewerline relocation out of the construction area. This will affect vegetative communities and potential wildlife habitats but only as a short-term impact to local fauna. The preservation of the woodlot will provide long-term valuable wildlife habitat in this urban area.

Aquatic Biota. Alteration of 5,700 to 7,550 feet of channel as considered will undoubtedly affect aquatic life within Holes Creek. Both flora and fauna will be disturbed from alteration of the present watercourse. Effects will occur from elimination and alteration of habitat variety and availability. Much of the physical aspect will be recreated by installing a low-flow channel, riffles and pools for the 500-year plan. Variation of the natural channel will, most likely, reduce species diversity within this area of the stream ecosystem. Fish migration to stream headwaters (if common) will be interrupted during construction (i.e., if undertaken in the spring). Construction will cause short-term sediment burial and disruption of benthic organisms along with some aquatic flora. Short-term water quality impact will

occur from increased suspended sediment as discussed previously. Low-flow conditions and removal of shade trees from along the stream, will impact to elevate water temperature. Decreased dissolved oxygen concentrations resulting from elimination of streambed characteristics (riffles, etc.) will impact to minimize the creek's pollutant assimilative capacity. But over a period of time, the stream will recreate these structures; this will focus only as a short-term effect.

Principal beneficial impacts of the channel improvement plan result from reduced flooding which will enhance long-term water quality and aquatic species productivity. New fish spawning areas will be created from sediment settling out of the water column after construction.

Threatened or Endangered Species. No biological species listed for Ohio have been known to occur within the study area; therefore, no impact is anticipated.

NATURAL RESOURCES - RIGHT BANK LEVEE PLAN

Soils, Erosion, and Streambank Effects. The right bank levee and floodwall plan for flood alleviation along Holes Creek will have adverse impacts concerning soils, erosion, and streambank effects. Adverse impacts will include short-term erosion during construction due to open exposure and disturbance of soil for an area of 11 acres. This erosion will result in sediment accumulations in the creek and will continue until natural vegetation is reestablished and soils are stabilized in the project area.

Required in levee construction will be approximately 13 acres of borrow area which will be subject to erosion and will produce an unavoidable change in local topography.

Upon completion of the project, graded side slopes of the new channel and levee will be either seeded or riprapped to minimize future streambank erosion

and reduce sediment accumulations to the creek. The realignment would eliminate one existing bank erosion problem, which would be beneficial.

Four acres of ponding area associated with this plan will provide a permanent undeveloped area for collection of behind levee drainage water that will be long-term land intensive.

Air Quality. Implementation of this alternative will result in an increased suspended particulate level to the area as fugitive dust from construction activities and from wind erosion of the disturbed soils. The condition will persist as a short-term effect only during the construction phase and will not have any long-term implication to the air quality of the area. There will be minor emissions of gaseous pollutants (hydrocarbons, carbon monoxide, nitrogen dioxide, and sulfur dioxide) from construction-related activities (i.e., vehicle traffic, earthmoving equipment, etc.). Here again, these emissions will only be generated over a short time period.

Water Quality. Short-term erosion, resulting from project construction will cause increased suspended sediment load to the creek. However with time, the revegetated soil will stabilize and this effect will diminish. Increases in stream velocity due to the 1,500 feet of channel realignment will also affect higher suspended solids levels. Temperature of the creek will be altered from changes in water velocity and removal of shade trees. Elimination of riffles within the streambed from channel realignment will incur a decrease in dissolved oxygen concentration and corresponding pollutant assimilative capacity for waters of the creek. Though these changes will result from implementation of this alternative, the net effect is not anticipated to involve any significant long-term impact to water quality of Holes Creek or the Miami River.

Noise Levels. Short-term increase in noise levels in the study area from construction activities will occur. This will cause a temporary inconvenience to area residents. Long-term impact will result from noise associated with the ponding area pumphouse, though this is not expected to be significant. No other long-term impacts are anticipated and no changes in noise levels from existing sources are expected.

Vegetation. Similarly to the channel improvement alternative, a significant adverse impact will occur from the preliminary land clearing and grubbing of vegetation. An estimated 11 acres of riparian vegetation will require stripping. However, the plan has a beneficial input in the preservation of about 1 acre of dense vegetation on the right bank downstream of Conrail Railroad. An area of about 13 acres will also necessitate clearing for excavation of the approximate 55,000 cubic yards of material needed to construct the 3,480-foot long earthen levee. A portion of this material, though, will be obtained from the new channel segment excavation. Additionally, the plan considers 4 acres of ponding area to be instrumental in the collection of surface runoff and storm sewer water on the inward side of the levee which will also require clearing. Altogether these disturbed areas will necessitate seeding and fertilizing for prevention of erosion. Selective planting in each of these areas will enable change to the existing environmental/habitats by introducing new species diversity. Other effects involve the disruption of vegetated areas upon relocation of utilities (e.g., water main and sanitary sewerlines, etc.) out of the considered project area. But this will incur only short-term impact.

Wildlife. Alteration of terrestrial vegetation and animal habitat from development of the embankment/channel realignment, ponding, and material borrow areas will inevitably focus to impact wildlife. The preservation of project lands and the undisturbed area west of Conrail Railroad will provide long-term lands for wildlife use. Construction and excavation activities causing noise, dust, and/or other short-term effects to the area will impact wildlife mobility and scarcity. Significant effects to species will be impacted from habitat burial or elimination. Selective planting of grass seed, shrubbery, etc., to disturbed areas will provide new habitat (for small animal species, e.g.,) to introduce new diversity culminating in the formulation of a new ecosystem. Normally, these changes correspond to species feeding, breeding, and/or migration habit alteration. Niche provision for new animal species may, in some instances, prove to be less desirable to the area residential community.

Lesser adverse impacts of the plan involve utilities (e.g., water main and sanitary sewerlines, etc.) relocation which will disrupt vegetative communities and potential wildlife habitats. Similarly to the considered channel improvement alternative, these effects will only be short-term.

Aquatic Biota. Adverse impact to aquatic life from this plan will occur within that reach of the stream considered for channel realignment. Improvement of this 1,500-foot segment will result in substrate alteration to eliminate variety and availability of stream habitats as well as to reduce the aquatic species diversity in this vicinity. Benthic organisms will be most affected. Ecosystem alteration resulting from habitat removal will effect many changes, e.g., removal of riffles will reduce pollutant assimilative capacity which is defined as the natural ability of a stream to degrade any discharged pollutants. Alteration of the stream channel can also influence any spring migratory patterns of fish species to headwaters of the creek. Levee construction and stream realignment will initially impart some degree of sedimentation from surface runoff. This will impact adversely to bury benthic organisms yet will, on the other hand, benefit fish species from the creation of new spawning areas.

Threatened or Endangered Species. No biological species listed for Ohio have been known to occur within the study area; therefore, no impact is anticipated.

NATURAL RESOURCES - FLOOD PROOFING PLAN

This plan would only have minor adverse impacts on the natural resources. Installation of closures and seals would cause practically no air, water, or noise impacts. However, care will be required to prevent any toxic materials from entering surface or ground water sources. A small amount of materials, although these would be likely to be highly refined, and energy would be required. The preservation of the stream corridor and adjacent wildlife habitats would enhance the environmental quality of the area.

CULTURAL RESOURCES

A review of the archaeological site files maintained by the Laboratory of Anthropology, Wright State University, Dayton, Ohio, indicated that a total of six prehistoric or historic archeological sites have been recorded in the vicinity of the proposed construction areas. Two of these sites lie directly in the path of the Owl Creek channel improvement. The westernmost site, the Perry Pease Mill and Distillery Site (33MY301) is, presumably, a now destroyed 19th Century historic site. The easternmost site (33MY131), the Alexandersville Earthworks, consists of a now completely leveled woodland period enclosure which originally covered approximately 31 acres.

Four archeological sites have been recorded in the vicinity of Holes Creek channel improvement, three of these being located on the grounds of the Siebenthaler Nursery Sites (33MY151), an archaic and/or woodland habitation, and 33MY152, a habitation site of undetermined cultural affiliation, are situated on the right bank of Holes Creek and east of Lamme Road. Site 33MY153, a habitation site of undetermined cultural affiliation, is located on the left bank of Holes Creek, west of Lamme Road, and north of Bellbrook Road. Site 33MY306, the Joseph Hyden Mill Site, probably dates to the 19th Century. This mill formerly stood on the left bank of Holes Creek near the western terminus of the channel improvement area.

As a result of extensive industrial and suburban landscape alterations, the in-field findings of an archeological reconnaissance were completely negative. However, it is recommended that the area be monitored by a professional archeologist during initial construction activities.

The National Register of Historic Places was consulted and there are no recorded Register properties in the vicinity of the proposed project area which would be affected. The field investigations revealed no historic buildings or structures which would be affected by any of the plans.

SOCIAL RESOURCES - CHANNEL IMPROVEMENT PLANS

Land Use. Impacts to land use within the study area will involve converting the riparian and adjacent lands into public lands for implementing the plan, plus, temporary lands necessary for disposal of spoils material. Property acquired for plan implementation will be permanently unavailable for private development, but would remain as open land.

The reduction of flood hazards in the area will make currently undeveloped land more attractive to developers for use as residential or commercial property. However, it is projected that the area will be essentially urbanized prior to project implementation.

Employment and Economic Development. The alternative will provide short- and potentially long-term beneficial impacts to employment in the area. A temporary increase in employment will result from construction jobs associated with the alternative. A long-term increase in employment would result from any increase in commercial and industrial development in the previously flood-prone areas.

A number of economic impacts will result. Tax revenues and property values, which to date have been depressed in the flood prone areas, most likely, will be upgraded as a result of increased maintenance and improved investment in the project area. This will be offset somewhat by the loss of property taxes on land purchased for the plan.

A long-term beneficial impact to public facilities and services in the area will also result. These benefits will be due to the elimination of service interruptions and damages to power, water, sewer, and transportation facilities. Fewer service interruptions and damages to local businesses and industries will result in fewer shutdowns and reduced financial losses. Less flood damage to private property will result in reduced financial losses to individuals and agencies.

Neither channel improvement plan will displace any residents, but both will require three commercial structures. Only temporary disruption of existing public facilities and services near the stream will occur during construction activities.

Community cohesion should improve since disruption from flooding will be reduced. All structures within the flood plain will be provided some degree of flood protection.

Transportation. Adverse impacts to transportation from construction activities associated with the channel improvement plan will be short-term. Long-term benefits resulting from less disruption of roads, bridges, and other transportation structures from flooding will enhance transportation. Physical damages to roads will be eliminated and costs will be reduced due to less traffic interruptions and rerouting.

Aesthetics. The principal effect from the channel improvement plan will occur in the change from the existing, natural setting to an artificial, manmade environment. However, flood prevention will alleviate the unaesthetic effect which now results from inundation as an areawide sedimentation problem. Although the plan will invoke short-term impact to surface water quality, no eminent health dangers are anticipated since no hazardous industrial dischargers are presently known to occur to the stream. Adversity to visual aesthetics will manifest from vegetation disturbance which resultingly affects area terrestrial and aquatic wildlife movement.

Restoration of the Old West Carrollton-Miami River Dam, presently under consideration by locals, plus the Dayton Strip and Node Corridor Recreation Plan could encourage development of new picnicking, biking, and hiking trails, etc., for this area.

SOCIAL RESOURCES - RIGHT BANK LEVEE PLAN

Land Use. Impacts to land use within the study area will involve an area of 11 acres for levee construction, plus about 1 acre of preservation lands and another 13 acres temporarily needed for excavation of the levee borrow material. This is principally idle (riparian) and agricultural (nursery) land. Property acquired for implementing the plan will be permanently unavailable for private development, but could be considered for open land leisure activities.

The plan will provide SPF degree of flood protection for only the right bank of Holes Creek which now is currently developed for residential and some commercial usage. Little changes will be expected from this form of land use. Property values will most likely be enhanced from project construction. For the left bank, no reduction of flood hazard will be provided and flood plain development will continue to be subject to flooding.

Employment and Economic Development. The project will provide short- and potential long-term beneficial impacts to employment in the area. A temporary increase in employment will result from construction jobs associated with the project.

A number of economic impacts could result from this project. Tax revenues and property values, which to date have been depressed in the flood prone areas, most likely, will upgrade as a result of increased maintenance and improved investment for the area protected by the levee. This will be offset somewhat by the loss of property taxes which would normally be obtained from the fee land required by the plan.

A long-term beneficial impact to public facilities and services in the area will also result from the project. These benefits will be due to the elimination of flood related interruptions and damages to power, water, sewer, and transporation facilities. Fewer service interruptions and damages to

local businesses and industries will result in fewer shutdowns and reduced financial losses. Less flood damage to private property will result in reduced financial losses to individuals and agencies.

Construction of the levee and floodwall is not expected to significantly disrupt any existing public facilities or services, nor to displace any existing structures. However, power and sewage lines, and water mains paralleling the stream will require relocation.

Community cohesion could deteriorate due to the inequitable flood protection between left and right banks of the creek. However, cohesion of the right bank area should improve.

Transportation. Adverse impacts to transportation from construction activities associated with the levee and floodwall will be short-term. Long-term benefits to the right bank resulting from less disruption of roads, bridges, and other transportation structures from flooding will enhance transportation. Physical damage to roads will be eliminated and costs will be reduced due to fewer traffic interruptions and rerouting. No changes will occur for transportation facilities on the left bank of Holes Creek.

Aesthetics. The major effect from this plan is the change from the existing, natural setting to an artificially developed environment. This plan will impact on aquatic habitats and surface water quality (i.e., at least within that reach of the creek considered for realignment). No immediate health problems are anticipated to result from this alternative since no industrial pollutants are currently known to be discharged to the stream. Natural vegetation will be disturbed, particularly in the right-of-way and material borrow areas.

Implementating the plan could initiate preservation of open space and new recreation (e.g., biking, hiking, picnicking, etc.) opportunities.

SOCIAL RESOURCES - FLOOD PROOFING PLAN

As this plan involves no major construction work and deals with individual houses, the significant social impacts are confined to aesthetics and community cohesion. The flood proofing plan would not impact on the aesthetics of the natural environment, but would impact on the general appearance of the protected area. With proper planning and construction techniques, the appearance change could be held to a minimum. The impact of the plan on community cohesion is potentially significant. This would result from unequitable flood protection being provided for the area. As the acquisition of enhancement lands does not include any improvements, no adverse social impacts are expected. The stream corridor aesthetics would be preserved.

Plan Selection

Plan selection is the designation of the alternative plan considered to be the most desirable. The plan should best meet the needs and desires of the public while adequately addressing the planning objectives, constraints, and criteria. Although a large number of factors are considered in selecting the best plan, the following tabulation shows the major considerations and the impacts of each flood control plan.

Factors	Plan A	Plan B	Plan C	Plan D
Views of Local Sponsor	Undesirable	Prefer Plan D	Prefer Plan D	Desirable
Net Benefits	$228,000	$102,000	$303,000	$161,000
Environmental	Positive	Adverse	Adverse	Adverse
Degree of Protection	100-Year for most residential	SPF right bank only	25-Year for major area	500-Year for major area
Equity of Protection	Fair	Poor	Good	Good
Remaining Conditions	Avg Ann Damages of $304,000 and adverse conditions remain	A.A.D. of $225,000 and flooding of left bank remains	A.A.D. of $108,000 and flooding becomes rare	A.A.D. of $70,000 and flooding is virtually eliminated

Plans A and B received no further consideration for selection as residual flooding and damages were substantial and neither plan was supported by the local sponsor. Further analysis of residual conditions with Plans C and D as compared to without conditions was accomplished. Table B-3 compares the overbank velocities and depths of flooding for the three conditions for the SPF future flow. Overbank velocities varying from 0.4 fps to 2.2 fps are not considered overly dangerous or destructive for any of the conditions. The depths of flooding for natural (0-6 feet) and as modified by Plan C (0-5 feet) would present a hazard to lives. This is especially true when considering there is no present effective warning system in the basin, and even if one was installed at a considerable expense the warning time would be short as the time of concentration is 6 to 7 hours. The residual flood depth with Plan D would be no greater than 2 feet and would present only a minor threat to lives. Table B-4 continues the comparison by presenting data for the three conditions concerning area and structural units flooded, and residual damages from the occurrence of an SPF. The flood limits for the SPF, natural and modified, are shown on Plate B-11. As shown in the table, Plans C and D would reduce the number of structures flooded by 76 or 8.2 percent, and by 588 or 63.6 percent, and the damages by $3.2 million or 31.7 percent, and $8.5 million or 84.2 percent, respectively. Plan D provides additional protection above Plan C by protecting 512 more structural units and reducing the SPF residual damages by an additional $5,300,000.

Based on the above tabulations and results of studies accomplished for this report and public views obtained, Plan D (500-year channel improvement plan) appears to best meet all selection factors. This plan provides a high degree of protection, has environmental engineering and mitigation measures for reducing adverse environmental impacts, provides equitable protection, is acceptable to the local sponsor, and has net beneficial contributions.

TABLE B-3

COMPARISON OF AVERAGE OVERBANK VELOCITIES AND FLOOD DEPTHS
FOR NATURAL AND MODIFIED BY PLANS C AND D
SPF FUTURE FLOW

Location	Left Overbank	Right Overbank
Velocities at Stream Mile 0.36 (HC-1)	0.4 fps Natural 0.5 fps Modified Plan C 0.5 fps Modified Plan D	0.4 fps Natural 0.4 fps Modified Plan C 1.3 fps Modified Plan D
Range of Flood Depths for HC-1 (Both banks)	0-6 feet Natural 0-5 feet Modified Plan C 0-2 feet Modified Plan D	
Velocities at Stream Mile 0.64 (HC-2)	1.2 fps Natural 1.2 fps Modified Plan C 1.3 fps Modified Plan D	0.9 fps Natural 0.7 fps Modified Plan C 0.6 fps Modified Plan D
Range of Flood Depths for HC-2 (Both banks)	0-5 feet Natural 0-5 feet Modified Plan C 1/ 0-1 foot Modified Plan D	
Velocities at Stream Mile 1.60 (HC-3)	1.9 fps Natural 1.9 fps Modified Plan C 1.7 fps Modified Plan D	2.2 fps Natural 2.2 fps Modified Plan C 2.0 fps Modified Plan D
Range of Flood Depths for HC-3 (Both banks)	0-2 feet Natural 0-2 feet Modified Plan C 2/ 0 foot Modified Plan D	

1/ Depth reductions of 0.4-0.5 foot.
2/ Depth reductions of about 0.1 foot.

TABLE B-4

COMPARISON OF STRUCTURAL UNITS, ACRES,
AND DAMAGES IN RESPECT TO NATURAL AND MODIFIED
SPF FLOOD CONDITIONS 1/ 2/

Item	Present SPF Conditions	Modified by Plan C	Modified by Plan D
Estimated Structural Units Flooded	924	848	336
Estimated Acres Flooded	502	462	213
Estimated Damages	$10,100,000	$6,900,000	$1,600,000

1/ Includes Reaches HC-1, HC-1P, HC-2 and HC-3.
2/ SPF under present flow conditions

The Selected Plan

The extent of the plan was based on economic and equitable protection concepts. The upstream limit of the plan was established about 1,000 feet upstream of Lamme Road in order to furnish full protection to the right bank below Lamme Road, where the potential for high damages exist, and to improve the stream characteristics at the Lamme Road bridge to negate potential future erosion problems and to provide some relief to the apartment complexes in the area. Although the major potential damage areas end at Conrail Railroad, the plan was carried downstream to Interstate 75 in order to furnish full 500-year headwater protection to the major damage areas. The extension of the channel is needed to prevent backwater effects from the unimproved channel below the terminus of the plan. The total length of the improved channel is about 7,550 feet.

Plan Features

DESIGN

The channel consists of four segments with transitions as necessary for each segment. The first segment begins at the upstream terminus of the plan which is about 1,000 feet upstream of the Lamme Road bridge and extends to the bridge. The first 500 feet of improvement consist of shaping banks to 3 horizontal to 1 vertical and riprapping. The next 500 feet consist of channel widening from 80 to 100 feet and using gabions on the left bank while carrying the 3:1 riprap slope for the right bank. The segment from Lamme Road to Springboro Pike consists of widening on the left side only, use of 6 horizontal to 1 vertical side slopes on the left bank, and a bottom width varying from 75 feet to 165 feet. Riprap will be placed on side slopes at channel

bends and other necessary locations. The next segment extends through the Springboro Pike bridge and downstream for about 120 feet and consists of a concrete channel with a base width of 144 feet. This segment was required to minimize bridge alterations and to reduce land requirements immediately downstream of the bridge to avoid a commercial establishment on the right bank. The last segment extends from the concrete channel to the downstream terminus. This segment consists of widening the channel and shaping slopes to 3 horizontal to 1 vertical. The slopes are riprap and the bottom width varies from 100 feet to 200 feet. The railroad bridge is replaced with a larger structure, and slopes under all bridges are either riprap or concrete. Environmental engineering measures to reduce the adverse impacts include the low flow channel with approximately 12 artificial pools and riffles, leaving approximately 3,800 feet of one bank in its natural state, and the planting of trees and shrubs. A woodlot of about four accres on the left bank downstream of Springboro Pike will be acquired in fee to preserve the area as a fish and wildlife mitigation measure. These measures are included to reduce impacts to the terrestrial and aquatic environment. Typical cross sections of Plan D and design data are shown on plates for this appendix.

HYDRAULIC DESIGN

The establishment of the termini of the plan was described in the opening paragraph of this section. Design channel velocities for the channel improvement range from 3.5 to 11 feet per second, with the 11 fps value in the concrete lined section. As the new channel will be constructed mainly in loamy outwash, a variety of bank protections and side slopes were used to prevent erosion. Steeper slopes, requiring protection, were necessitated in some areas by overbank development and to minimize alterations at existing bridges. The channel segment above Lamme Road was riprap, except for gabions on the left bank along an apartment complex, in order to utilize the existing bridge. A flat slope of 1V:6H for the grass-lined channel from Lamme Road to Springboro Pike was used on the left bank and the right bank will be maintained at existing conditions in this reach as much as possible for environmental reasons. The toe of this excavation was riprapped two vertical feet up

the bank to stabilize the bank from eroding. This segment will transition by riprap slopes to a concrete channel 144 feet wide with 1:1 slopes. This design was used to utilize the existing bridge and to protect the development on the right bank downstream of the bridge. The channel below the concrete portion will be riprapped to 1V:3H. Riprap was used because of the restrictive nature of the area and also to reduce the cost of larger bridge structures. The replacement of Central Avenue and East Dixie Drive is not required when riprapped slopes are used. In addition, a smooth uniform flow condition results. Even with these features, the Contrail Railroad bridge is inadequate to carry design flows and will be replaced by a new bridge.

Channel roughness coefficients used in the step backwater computations were 0.033 for combination grass and natural slopes; 0.040 for riprap slopes; and 0.012 for concrete lined channel. The overbank roughness coefficients remained basically the same as for existing conditions. The improved channel grade would be a little steeper due to the shorter channel length (see Plate D-9).

EARTHWORK

Channel excavation is expected to encounter no rock and consist primarily of gravel, sand, and silt deposits. These conclusions are based on soils information in Appendix A, surface and streambank observations, and review of available geological data. The rock line is reported to be over 100 feet below ground surface. Some of the excavated material will be used for filling the old channel and adjacent low areas. However, most of the excavated material will have to be hauled to disposal sites. Determining the best available site was beyond the scope of this investigation as future development could negate the availability of a site. To determine the appropriate cost for disposal it was assumed that some hauling would be necessary and the acquisition of temporary easements for the disposal sites. The gravel pits west of the Miami River represent the best potential for disposal areas and were used as the bases for the easements costs. The gravel pits are located about 2 to 2-1/2 miles from the proposed excavation work. Two bridges cross the Miami

River in the general area and provide access to the disposal sites. It is estimated that about 15 acres of gravel pits would be required. A total of about 55 acres of gravel pits are estimated to be in existence by 1985.

RELOCATIONS

The major relocation item required for the recommended plan consists of replacing the Conrail Railroad bridge. A double track mainline of the Conrail Railroad, formerly Penn Central Railroad, crosses Holes Creek about river mile 0.34. The existing bridge has four 20-foot openings (vents) that catch debris and restrict channel flow. The new bridge would be constructed north of the existing bridge and slightly east of the existing track in order to maintain traffic over the existing track during construction as shown by Plate B-5. This eliminates the need for a temporary trestle (bridge) and improves the alignment of Holes Creek. The new structure would have a 200-foot bottom width, 284-foot top width, a bicycle trail on the left berm, and two piers as shown on Plate B-8. This relocation cost will be carried out at Federal expense in accordance with Section 3 of the 1946 Flood Control Act.

The only major road relocation item is modification of the Springboro Pike (Route 741) bridge. This bridge is a four lane highway (56 feet wide including shoulders) without a median and crosses Holes Creek at existing creek mile 0.62. The existing bridge bottom width is 65 feet; top width is 120 feet with two piers 17 feet high. Current plans are to add a 40-foot span to the southern end of the bridge which includes constructing a new abutment and replacing the old abutment with a pier. This structure is located on the recommended plan at approximately channel station 26+00 and would have a 144-foot bottom width with a concrete paved channel through the structure.

Individual utility companies were contacted to determine the location and type of any underground utilities in the affected areas. Encasement and re-alignment of sewers and water lines are the main cost items. Existing utilities in the area are shown on Plate B-10. The recommended plan would require concrete encasement of two water lines and three sanitary sewer lines

where they cross the improved channel. The plan would also require relocation of about 1,700 feet of 42-inch sanitary sewers with three manholes and clean-outs, 1,700 feet of 8-inch water line and 11 utility poles.

REAL ESTATE

Total fee land required for the recommended plan is about 38 acres. This includes the woodlot of 4± acres that is to be preserved in its natural state. Temporary easements on about 15 acres are required for disposal of excavated material. The fee acquisition includes 10 feet each side of the proposed top of bank of the improved channel for construction and operation and maintenance uses. The cost for lands and damages shown in Appendix E includes all costs for lands, improvements, and easements. Improvements required are two buildings used in the adjacent nursery's operation, a commercial building on Springboro Pike occupied by ICON Corporation, and three pump facilities owned by National Cash Register that furnish water for NCR Golf Course. As no residential units are to be acquired, relocation assistance under Public Law 91-646 is not applicable.

RECREATION

As the recreation development must be constructed on lands acquired for the flood control plan and are dependent upon the desires and needs of the local sponsor, the exact type and quantity of facilities can only be estimated at this time. To provide day use type activities of walking, jogging, bicycling, outdoor games, and limited picnicking, recreation facilities consisting of about 9,000 feet of paved trails, picnic units, potable water, and play equipment were added to the selected plan. The 8-foot paved trail consists of two segments, of which, one segment would extend along the left bank from Lamme Road to its intersection with the South Montgomery County Bikeway just west of Interstate 75. The second segment extends from the footbridge in the vicinity of Butler Street access site along the right bank eastward to Lamme Road. The plan includes the purchase of four small tracts (the largest consisting of about 1/2 acre) for access to the facilities. The facilities are

to be used as a neighborhood type park with no parking facilities. Plate B-5 provides a general layout of the recreation plan.

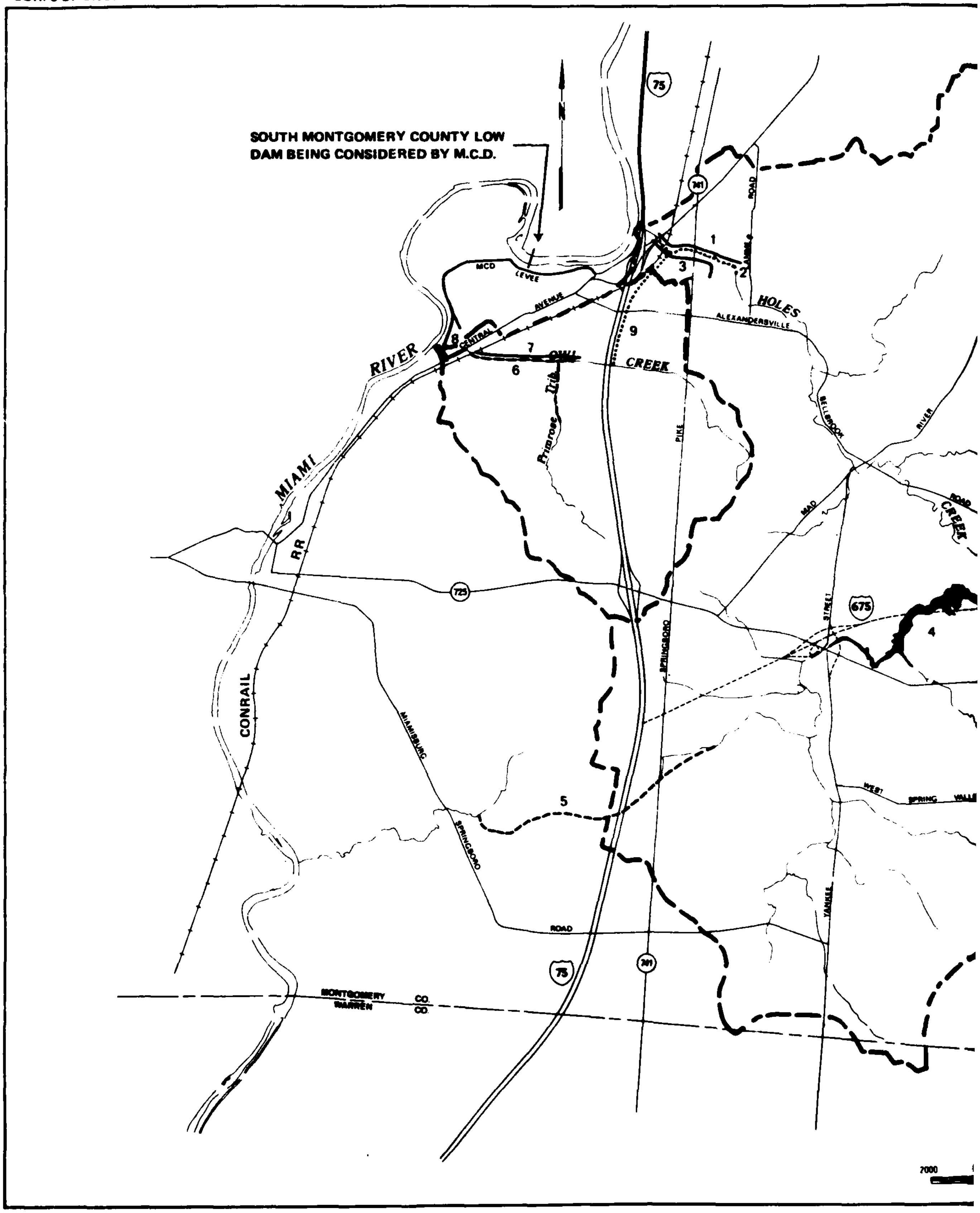
Construction

Assuming authorization and funds availability, it is estimated that the project could be designed and constructed in about four years. The time estimated for construction alone is from 1-1/2 to 2 years. Major construction items include 185,000 cubic yards of excavated material and the Conrail Railroad bridge. During construction, protective measures cited in the environmental guidelines for the civil works program of the Corps of Engineers would be enforced for such things as erosion, dust control, and proper debris disposal methods.

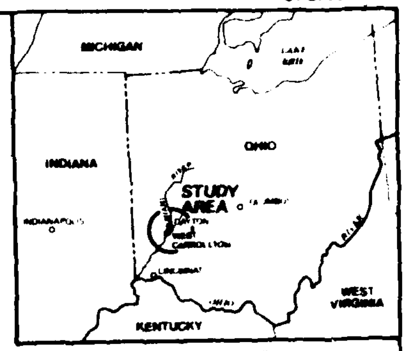
Operation and Maintenance

The local sponsor (the Miami Conservancy District) has furnished a letter of intent to accept the channel works, EQ measures, and recreational facilities after completion and to insure maintenance and operation in accordance with Federal regulations. The major items of operation and maintenance of the completed project include: mowing the grass portion of the channel, periodic cleanout of the channel, and repair of erosion damage to the slopes and lined portions of the channels. The recreational facilities require periodic cleanup, repair and replacement of equipment and policing of the area. The Miami Conservancy District is presently operating and maintaining five large retarding structures and nine local protection projects consisting of levees and channel improvements. With this background the Miami Conservancy District was consulted in respect to the annual operation, maintenance, and major replacement costs for the selected plan.

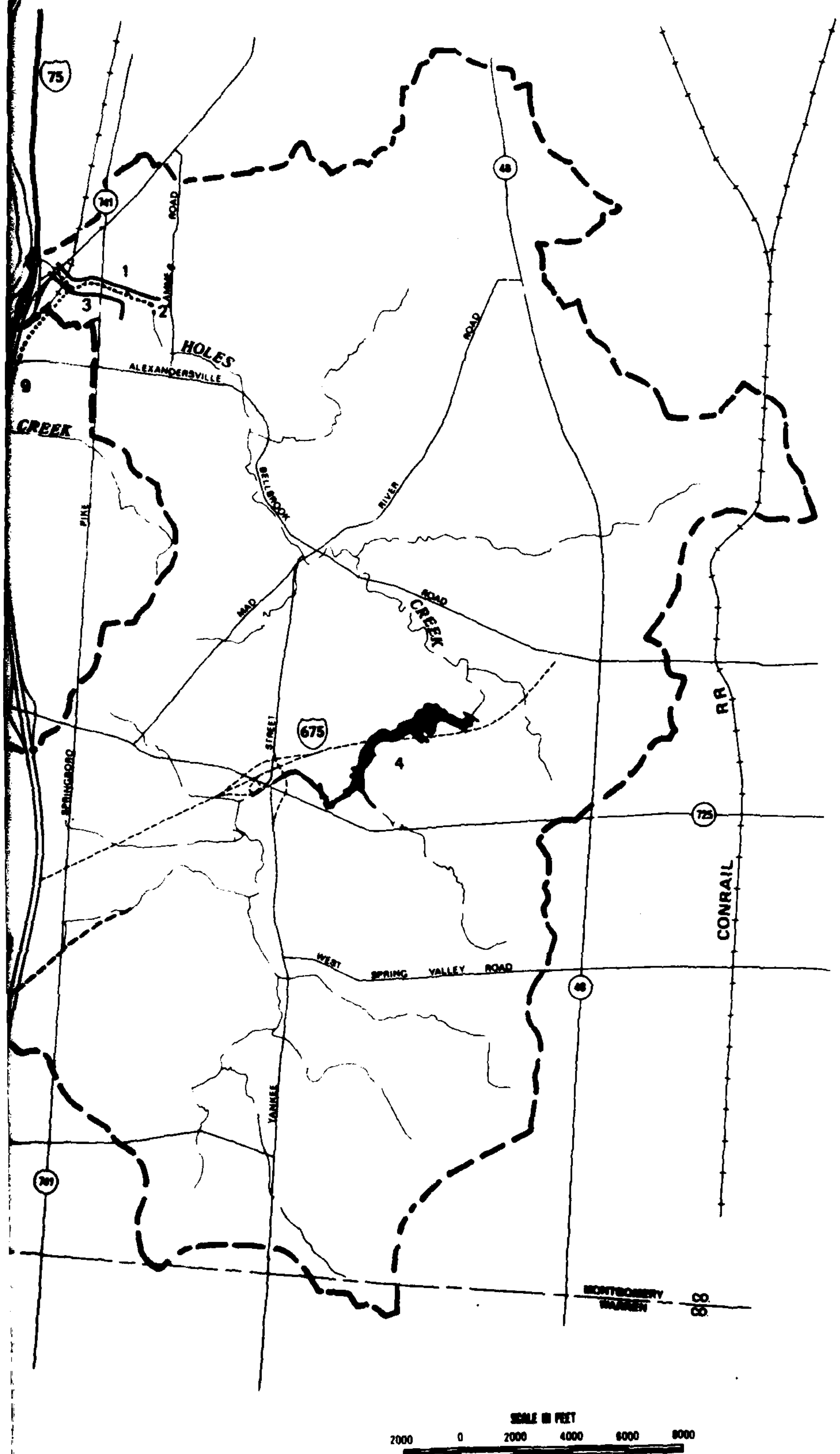
CORPS OF ENGINEERS



U. S. ARMY



VICINITY MAP



LEGEND

1. HOLES CREEK RIGHT BANK WALL AND LEVEE
2. HOLES CREEK CHANNEL IMPROVEMENT
3. HOLES CREEK LEFT BANK LEVEE
4. HOLES CREEK RESERVOIR
5. HOLES CREEK BASIN TRANSFER
6. OWL CREEK CHANNEL IMPROVEMENT
7. OWL CREEK WALL AND LEVEE
8. ALLEN PLAT WALL AND LEVEE
9. OWL CREEK DIVERSION TO HOLES CREEK

MIAMI RIVER BASIN

HOLES CREEK

CONSIDERED PLANS

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD–F SEPTEMBER 1980


EAST DIXIE DRIVE
I-75 RAMP
I-75
SCALE IN FEET
200
0
200
400
SHEFFIELD
ORMAND

MIAMI RIVER BASIN

HOLES CREEK

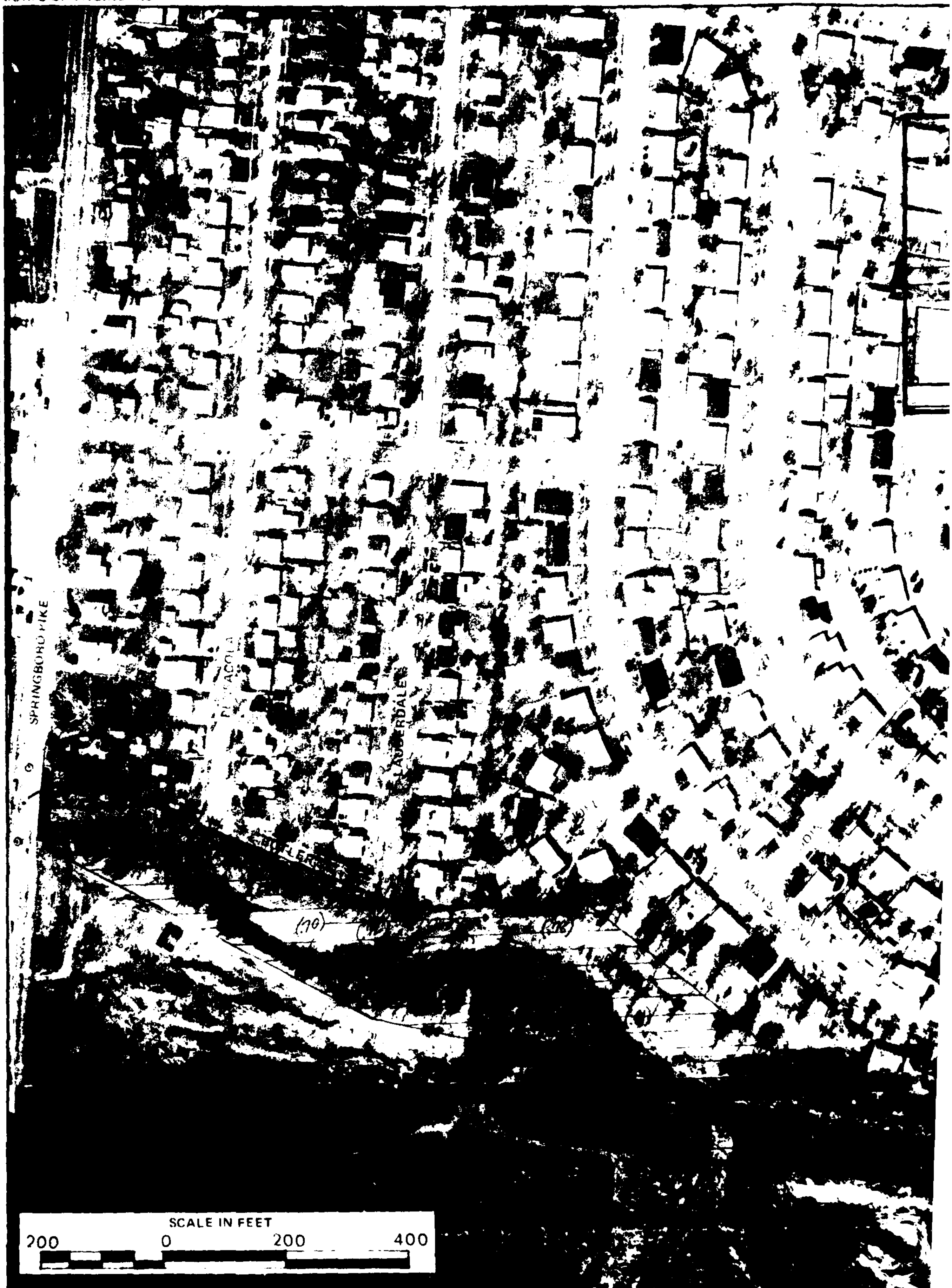
ENVIRONMENTAL
ENHANCEMENT
LANDS - PLAN A

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD-F SEPTEMBER 198(

CORPS OF ENGINEERS

MATCH LINE A



MATCH LINE B

U. S. ARMY

MIAMI RIVER BASIN

HOLES CREEK

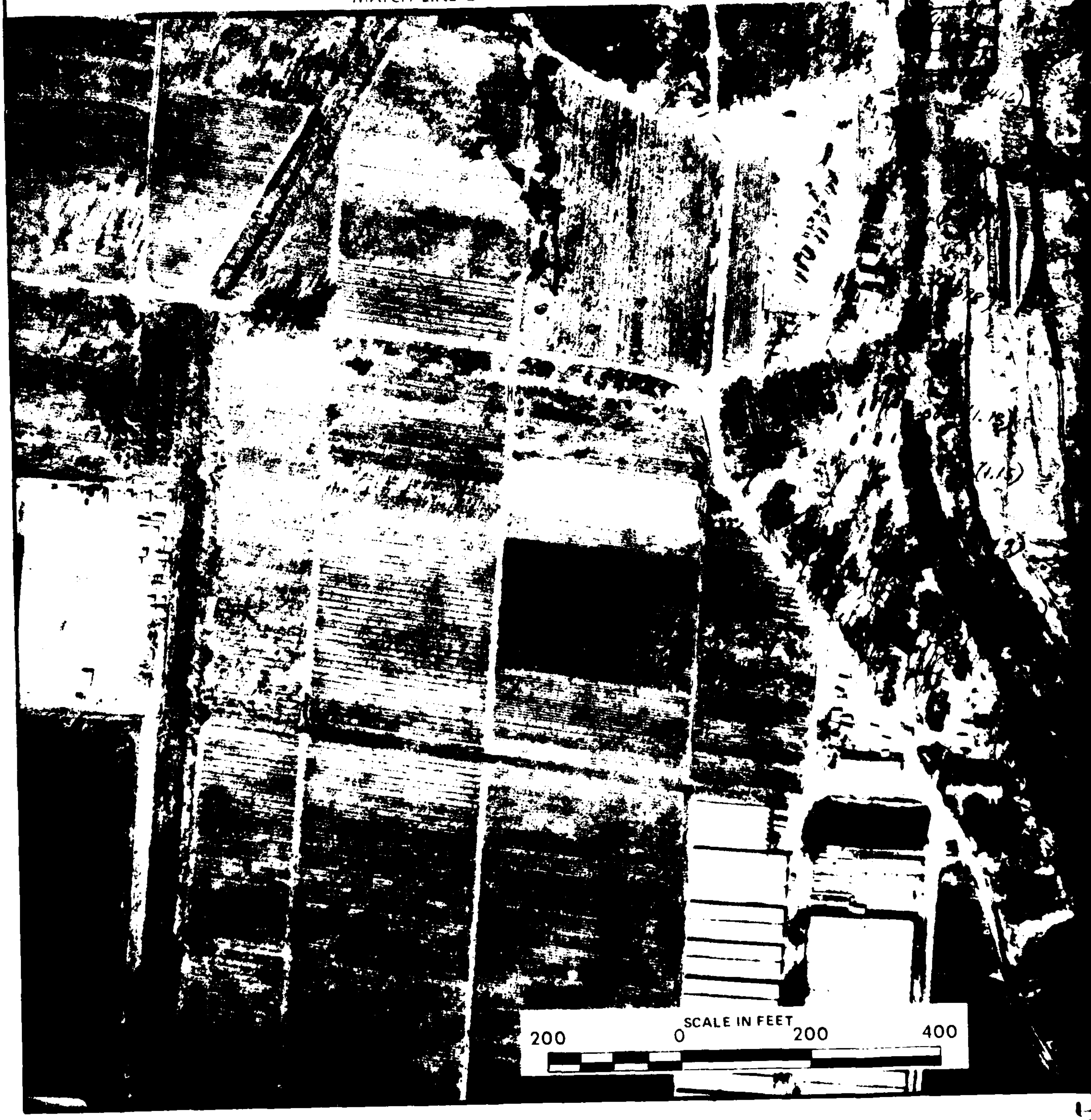
ENVIRONMENTAL
ENHANCEMENT
LANDS – PLAN A

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD–F SEPTEMBER 1980

MATCH LINE B

MATCH LINE B



U.S. ARMY

SHEET 3 OF 3 APPENDIX B PLATE B-2


EAST DIXIE DRIVE
I-75 RAMP
N
SCALE IN FEET
200 0 200 400

MIAMI RIVER BASIN

HOLES CREEK

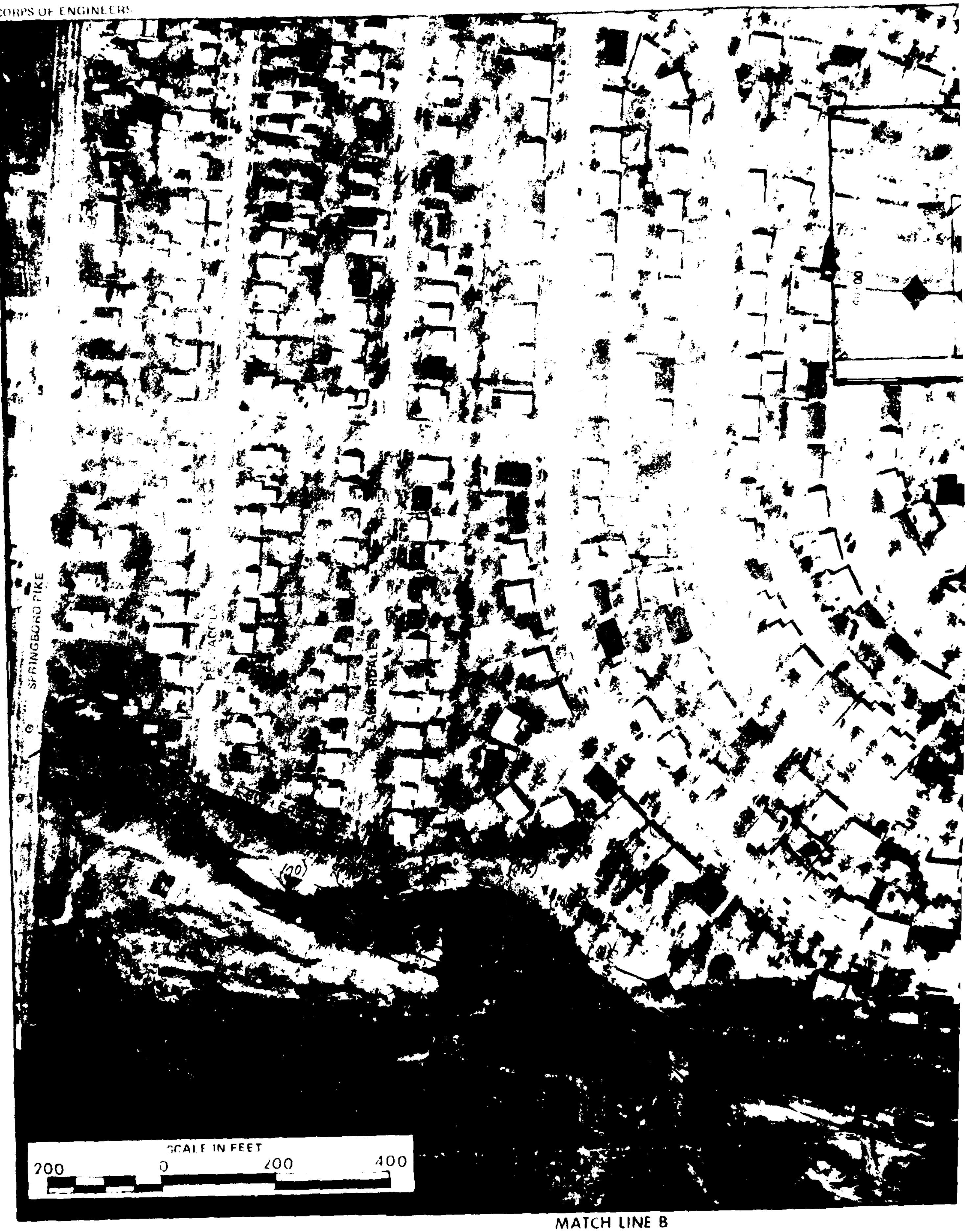
RIGHT BANK LEVEE – PLAN B

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

ORLPD-F SEPTEMBER 1980

CORPS OF ENGINEERS

MATCH LINE A



MATCH LINE B

MIAMI RIVER BASIN

HOLES CREEK

RIGHT BANK LEVEE –
PLAN B

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY

ORLPD--F SEPTEMBER 1980

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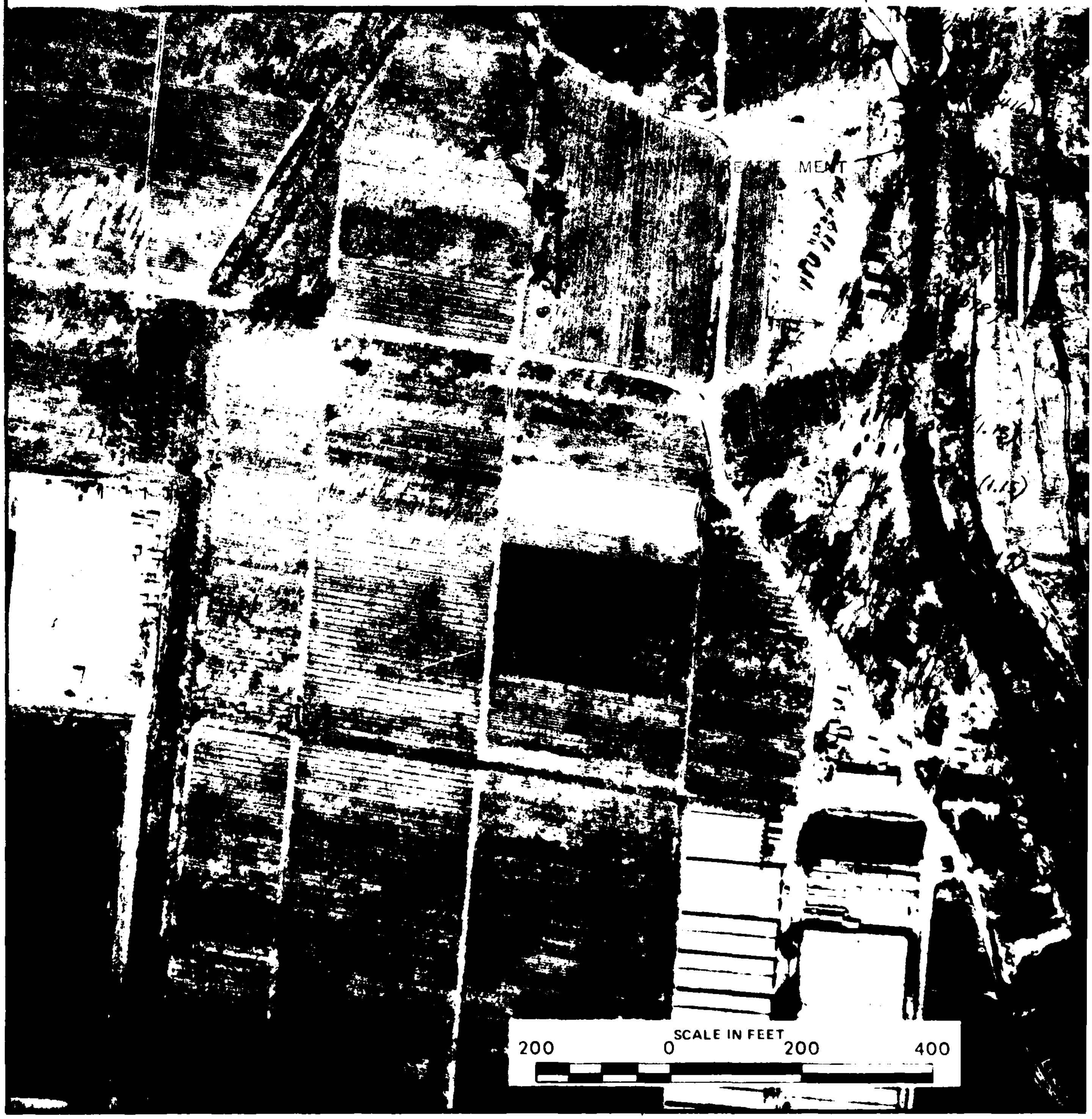
MATCH LINE B



MIAMI RIVER BASIN

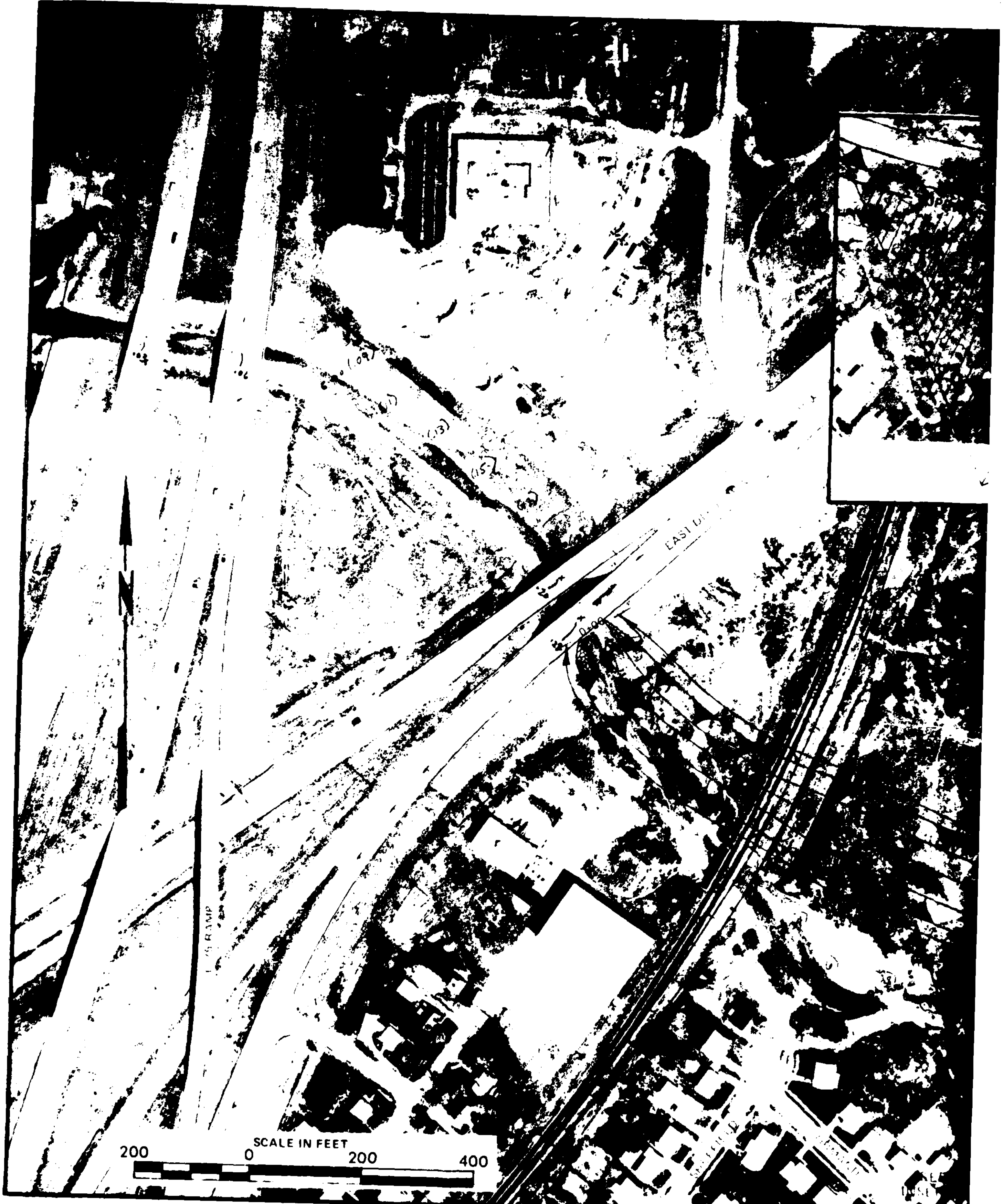
HOLES CREEK

RIGHT BANK LEVEE – PLAN B

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE KY

ORLPD-F SEPTEMBER 1980

CORPS OF ENGINEERS



MIAMI RIVER BASIN
HOLES CREEK
25 YEAR CHANNEL – PLAN C
U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY
ORLPD–F SEPTEMBER 1980

CORPS OF ENGINEERS

MATCH LINE A

MATCH LINE B

U. S. ARMY

MIAMI RIVER BASIN

HOLES CREEK

25 YEAR CHANNEL –
PLAN C

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD--F SEPTEMBER 1980

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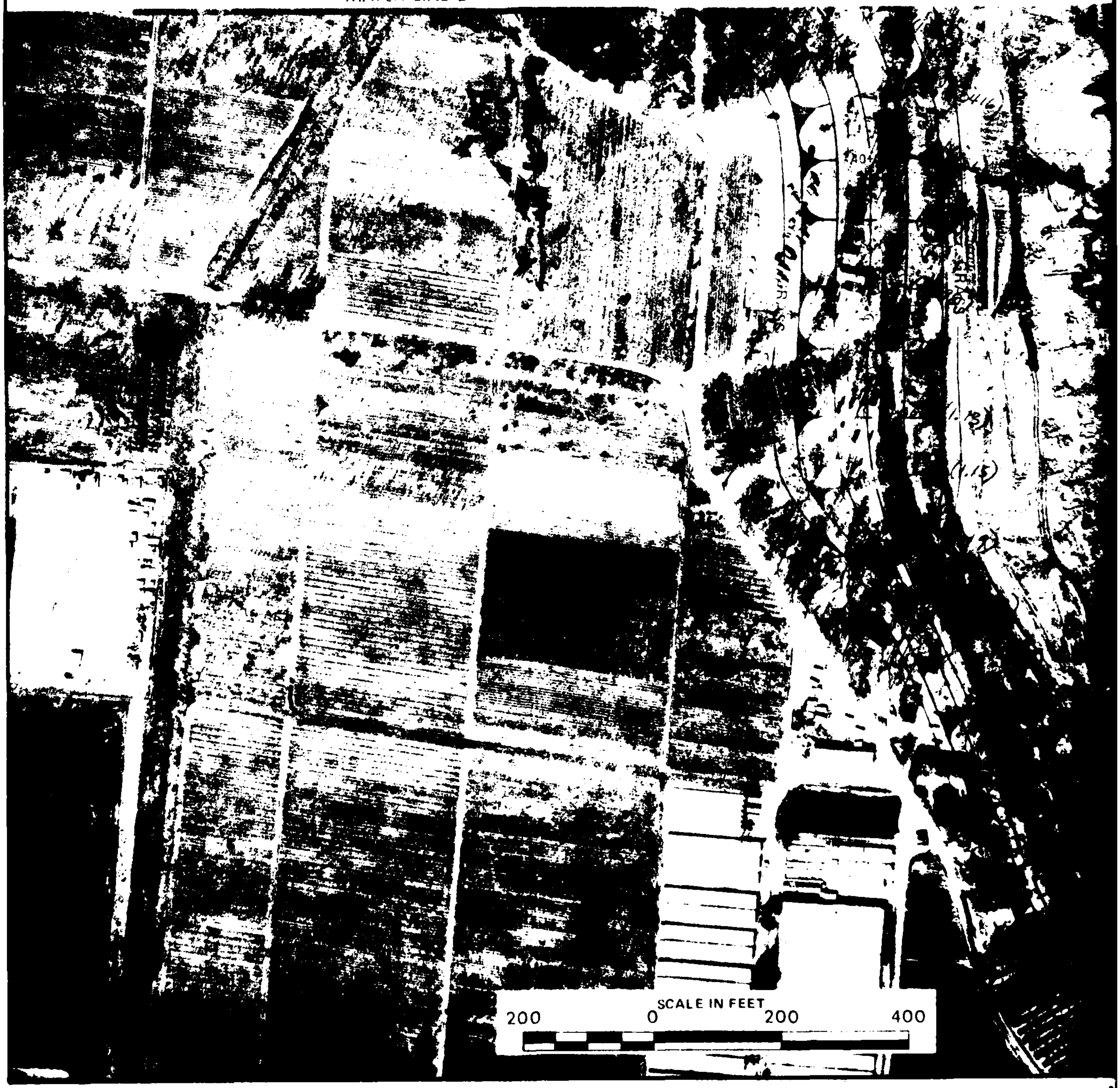


U S ARMY

MIAMI RIVER BASIN

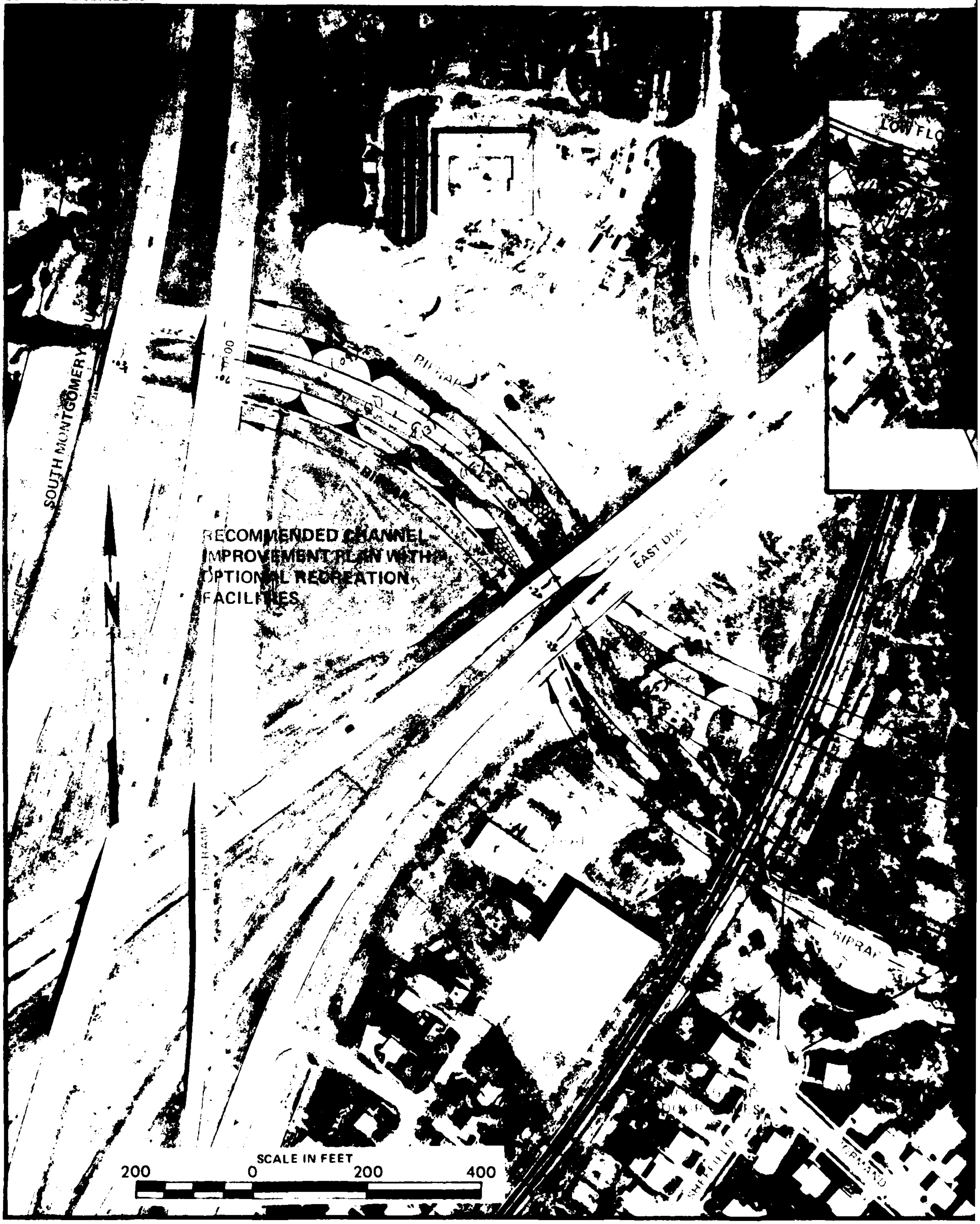
HOLES CREEK

25 YEAR CHANNEL
PLAN C

U S ARMY ENGINEER DISTRICT
LOUISVILLE, KY

ORLPD- F SEPTEMBER 1980

CORPS OF ENGINEERS

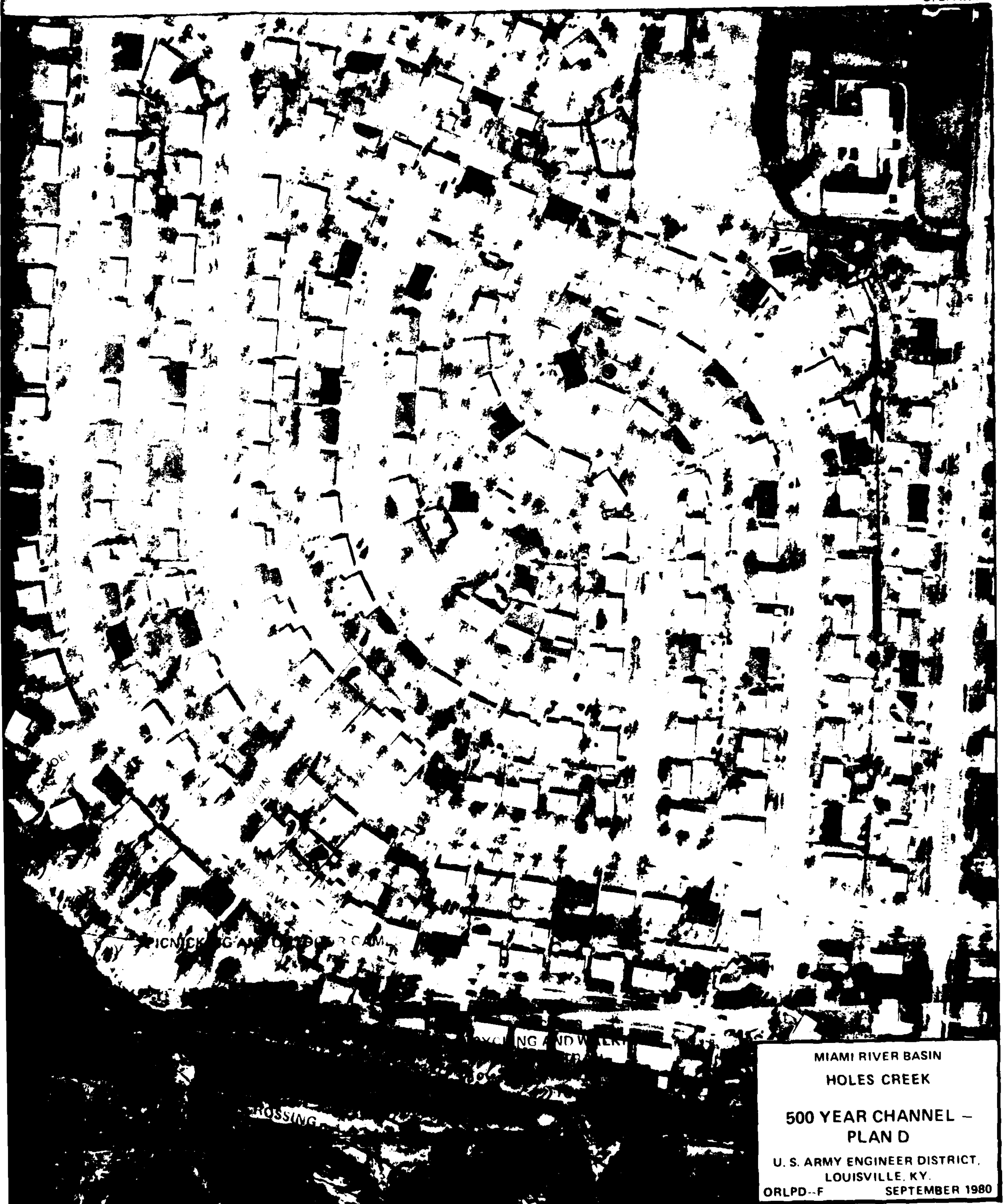



OF
WOODLOT
MATCH LINE A
MIAMI RIVER BASIN
HOLES CREEK
500 YEAR CHANNEL –
PLAN D
U.S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY
ORLPD-F
SEPTEMBER 1980

MATCH LINE A

MATCH LINE B

U. S. ARMY



MIAMI RIVER BASIN

HOLES CREEK

500 YEAR CHANNEL – PLAN D

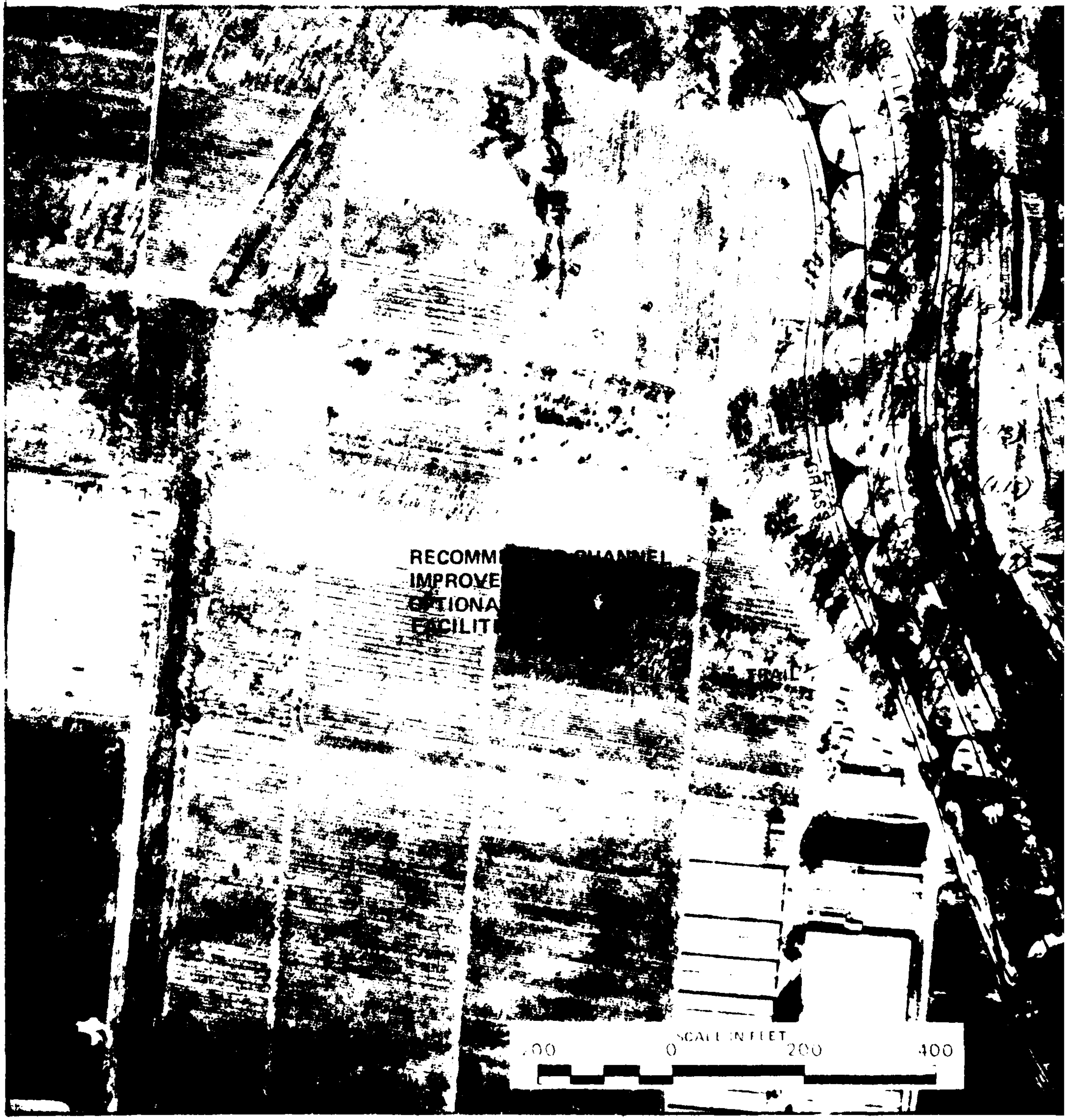
U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

ORLPD--F SEPTEMBER 1980

SHEET 2 OF 4 APPENDIX B PLATE B-5

MATCH LINE B

MATCH LINE


RECOMM
IMPROVE
OPTIONA
FACILIT
GRASS
TRAIL
SCALE IN FEET
200 0 200 400

MATCH LINE C

MIAMI RIVER BASIN

HOLES CREEK

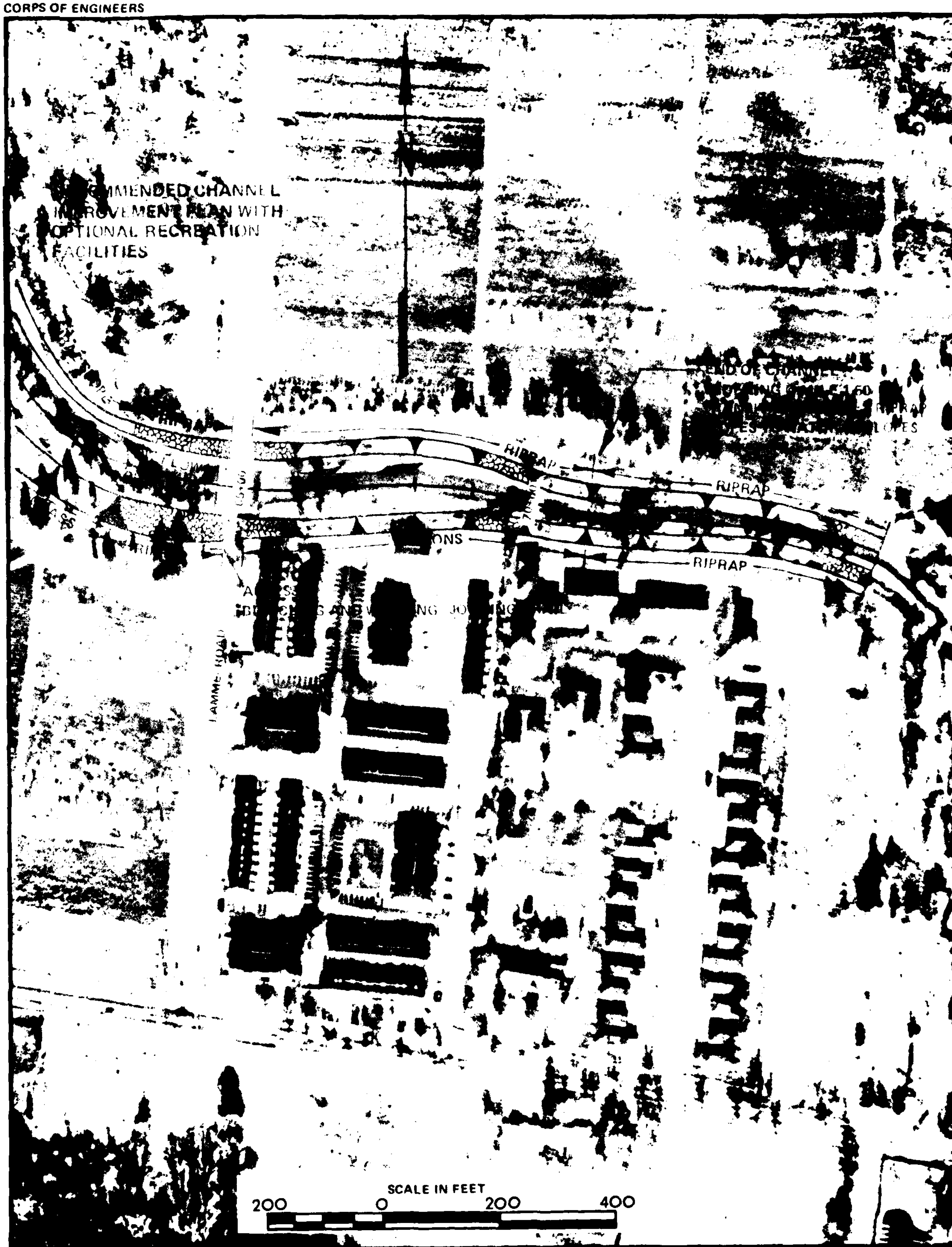
500 YEAR CHANNEL –
PLAN D

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD–F SEPTEMBER 1980

2

MATCH LINE C


IMPROVEMENT PLAN WITH
FACILITIES
RIPRAP
RIPRAP
RIPRAP
LAMME ROAD
SCALE IN FEET
200 0 200 400

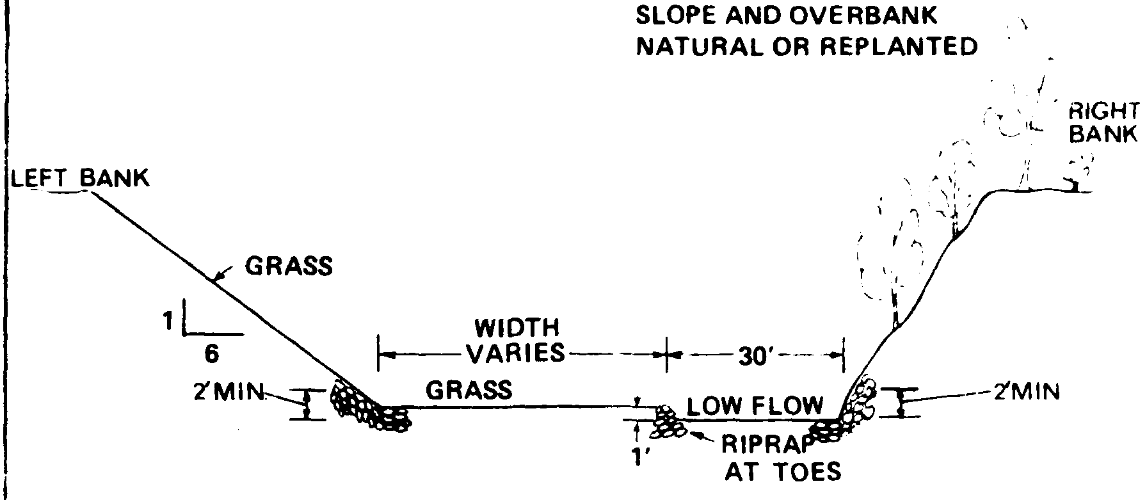
U.S. ARMY

MIAMI RIVER BASIN

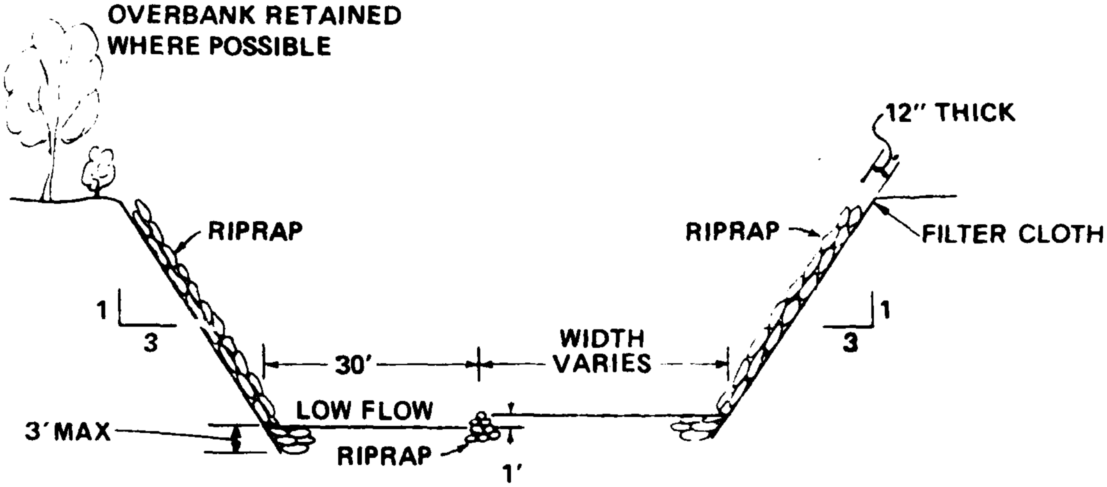
HOLES CREEK

500 YEAR CHANNEL –
PLAN D

U.S. ARMY ENGINEER DISTIRCT,
LOUISVILLE, KENTUCKY
ORLPD--F SEPTEMBER 1980



TYPICAL SECTION
UPSTREAM OF SPRINGBORO PIKE



TYPICAL SECTION
DOWNSTREAM OF SPRINGBORO PIKE

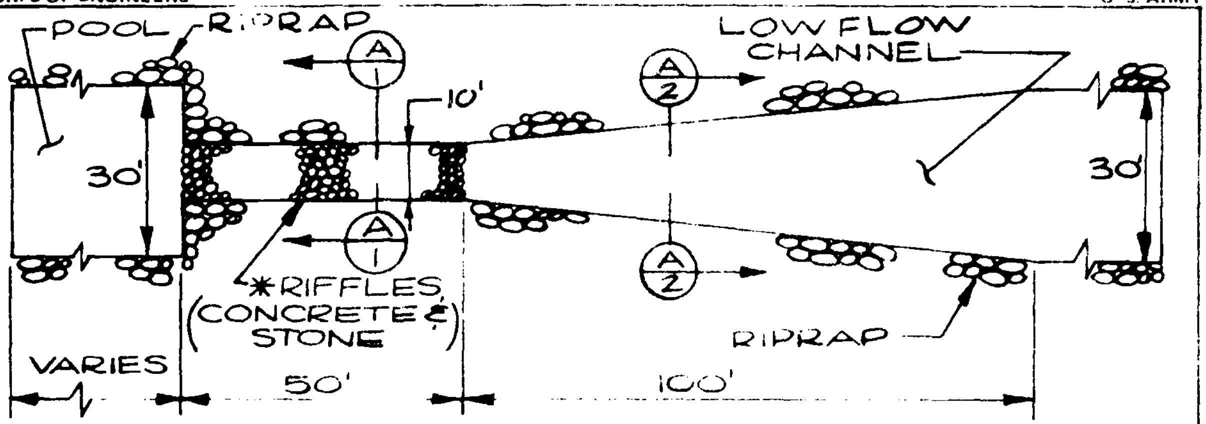
NOT TO SCALE

MIAMI RIVER BASIN
PLAN D
TYPICAL DESIGN SECTIONS
OF
CHANNEL IMPROVEMENT PLANS

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD--F SEPTEMBER 1980

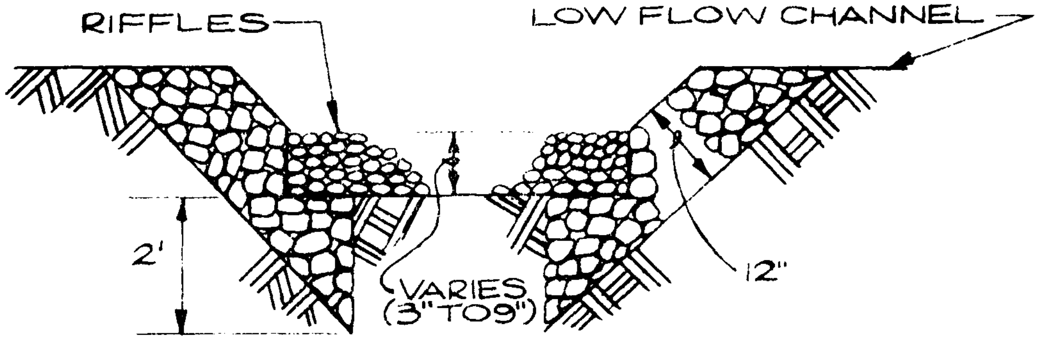
REV 20MAR 81



*POSITIONING OF RIFFLES WILL VARY ACCORDING TO FISH AND WILDLIFE SERVICE.

TYPICAL PLAN OF LOW FLOW CHANNEL

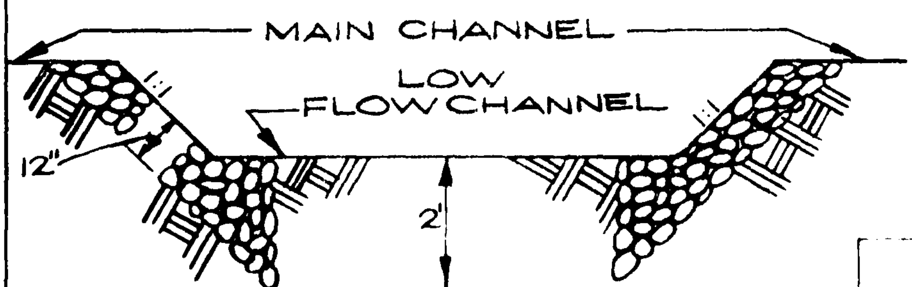
30 0 30 60
SCALE IN FEET



SECTION A 1

RIFFLES

SCALE: NONE



SECTION A 2

LOW FLOW

SCALE: NONE

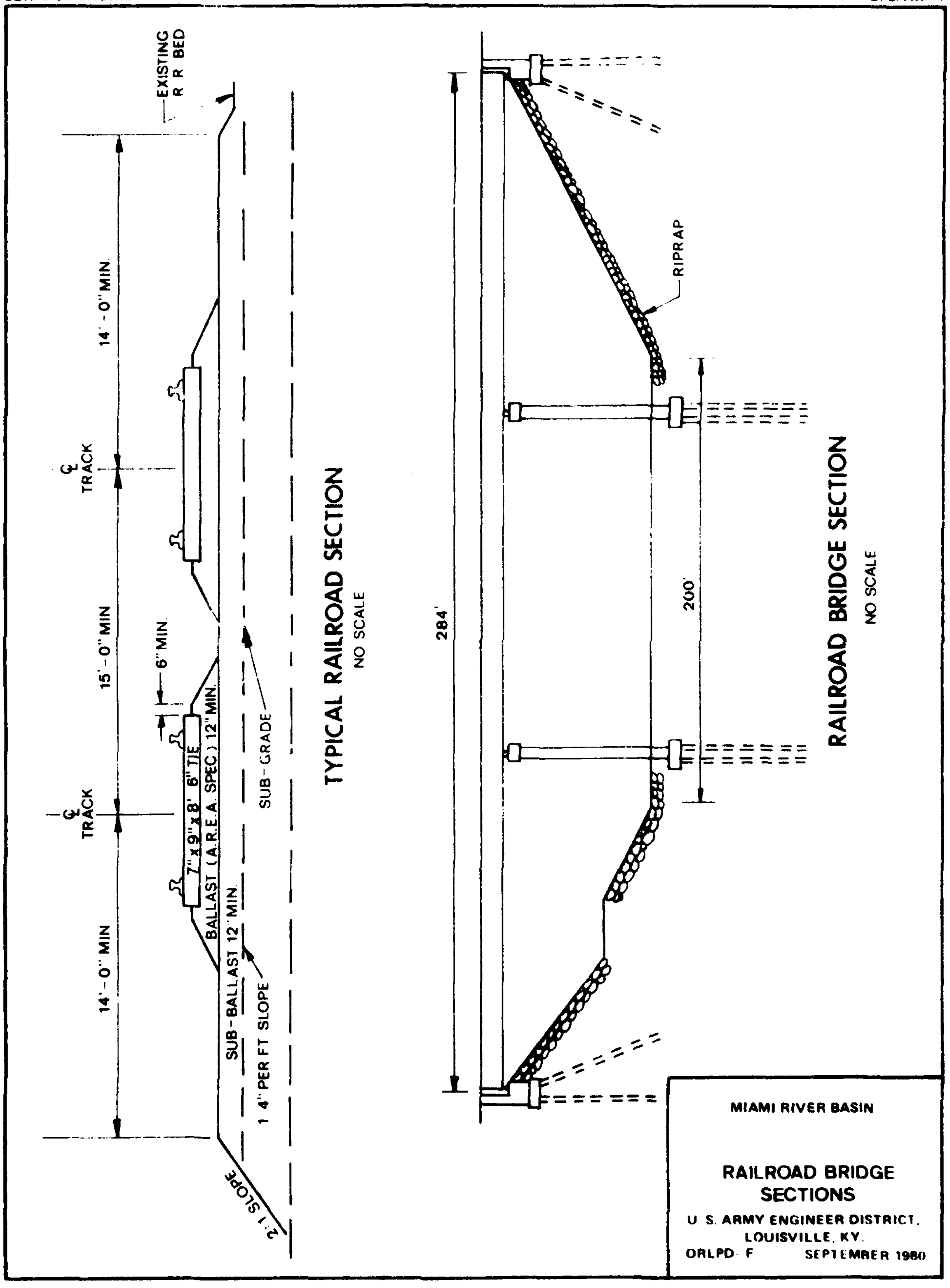
MIAMI RIVER BASIN

HOLES CREEK

LOW FLOW CHANNEL

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

ORLPD–F SEPTEMBER 1980

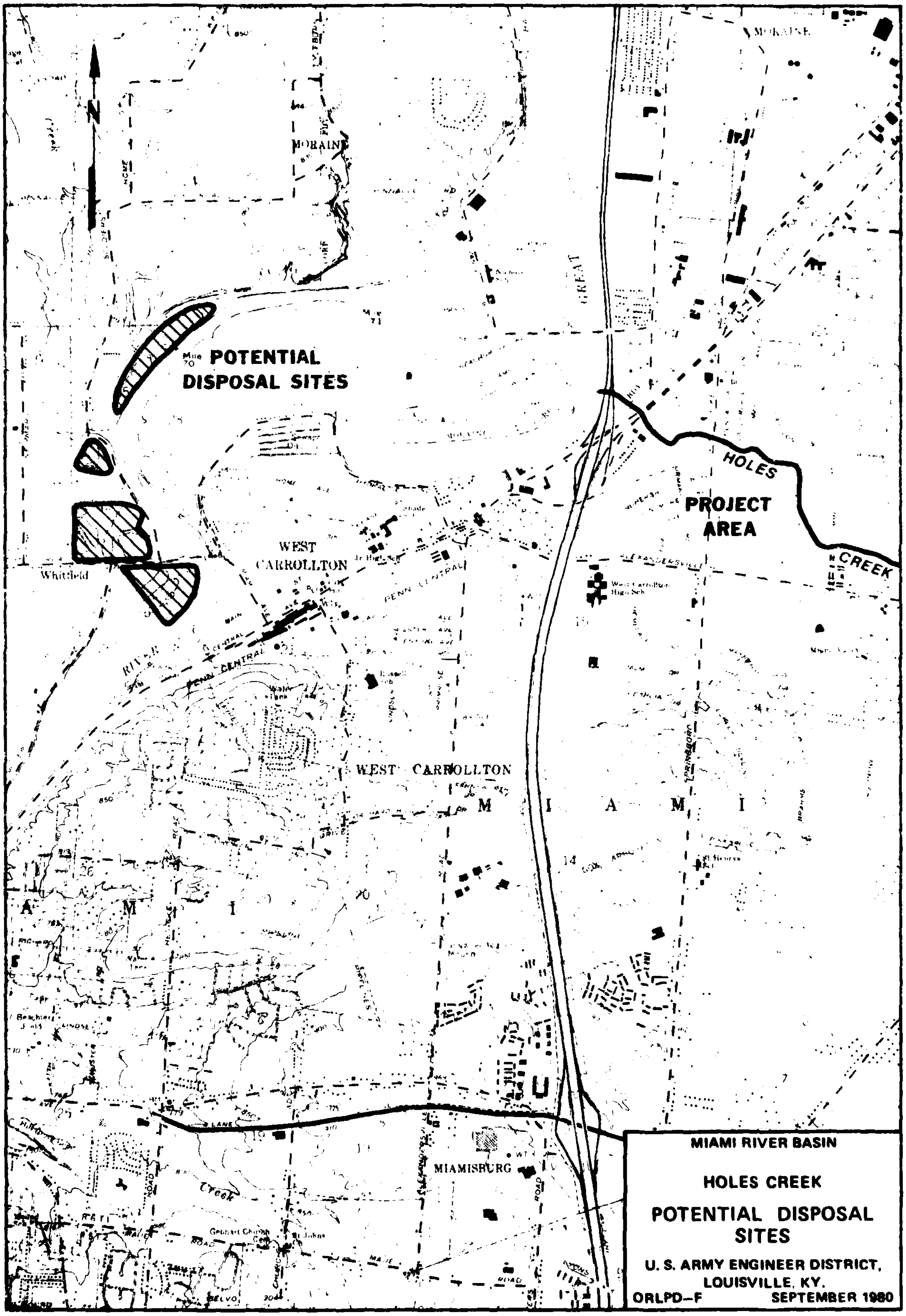


MIAMI RIVER BASIN

RAILROAD BRIDGE SECTIONS

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

ORLPD- F SEPTEMBER 1980


POTENTIAL
DISPOSAL SITES
PROJECT
AREA
HOLES
CREEK
MORAINE
WEST
CARROLLTON
Whitfield
WEST CARROLLTON
M I A M I
MIAMISBURG
Creek
GREAT
PENN CENTRAL
RIVER
MIAMI RIVER BASIN
HOLES CREEK
POTENTIAL DISPOSAL
SITES
U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.
ORLPD-F SEPTEMBER 1980


N
P.O.T. U
EAST DIXIE DRIVE
P.O.T. U
I-75 RAMP
SCALE IN FEET
200 0 200 400
ORMAND

U S. ARMY

MATCH LINE A

MIAMI RIVER BASIN

HOLES CREEK

UTILITIES

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.
ORLPD–F SEPTEMBER 1980


MATCH LINE A
PUMP HOUSE
SCALE IN FEET
200
0
200
400
MATCH LINE B

U.S. ARMY

MIAMI RIVER BASIN

HOLES CREEK

UTILITIES

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD - F SEPTEMBER 1980

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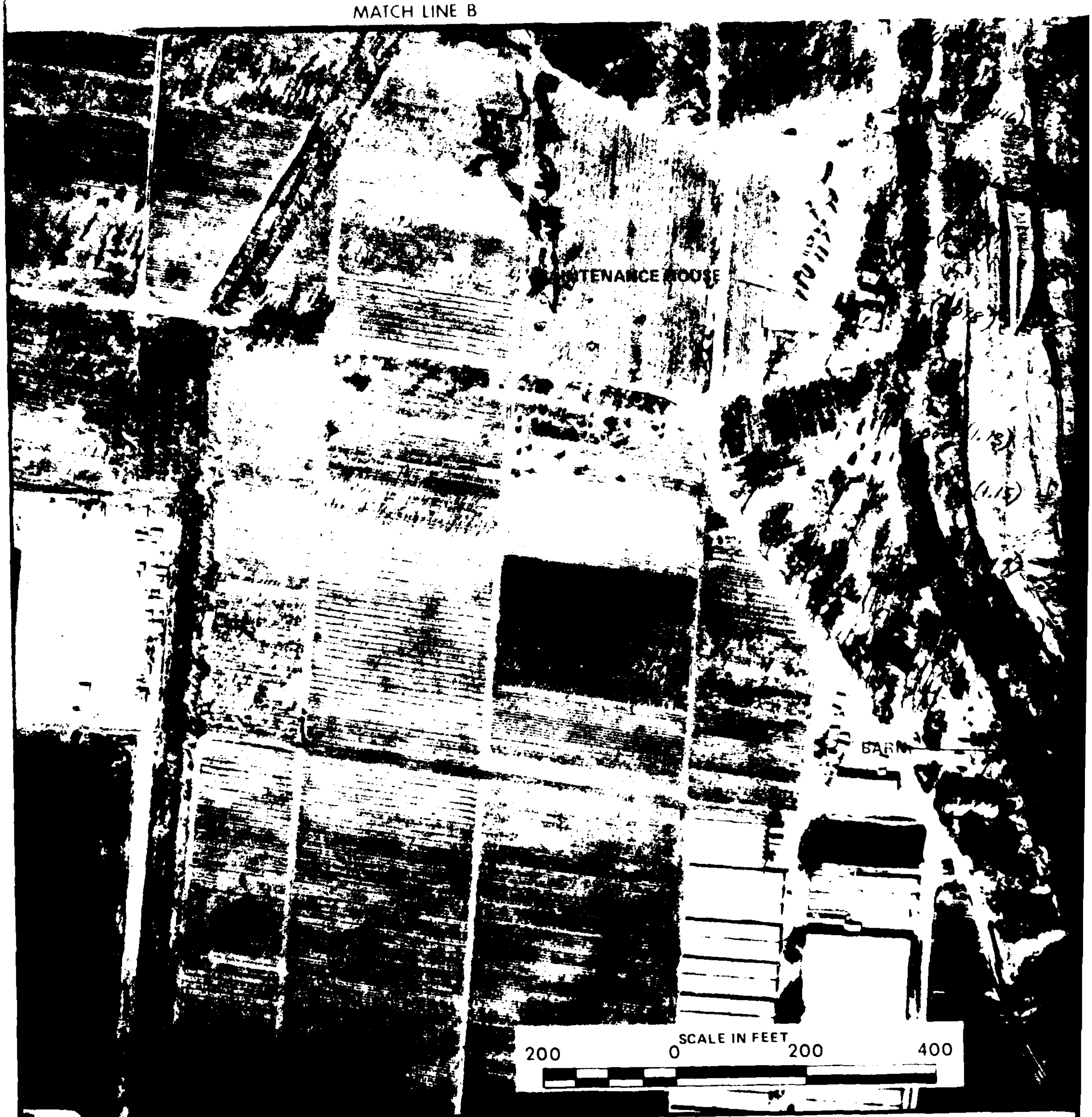
MATCH LINE B



U.S. ARMY

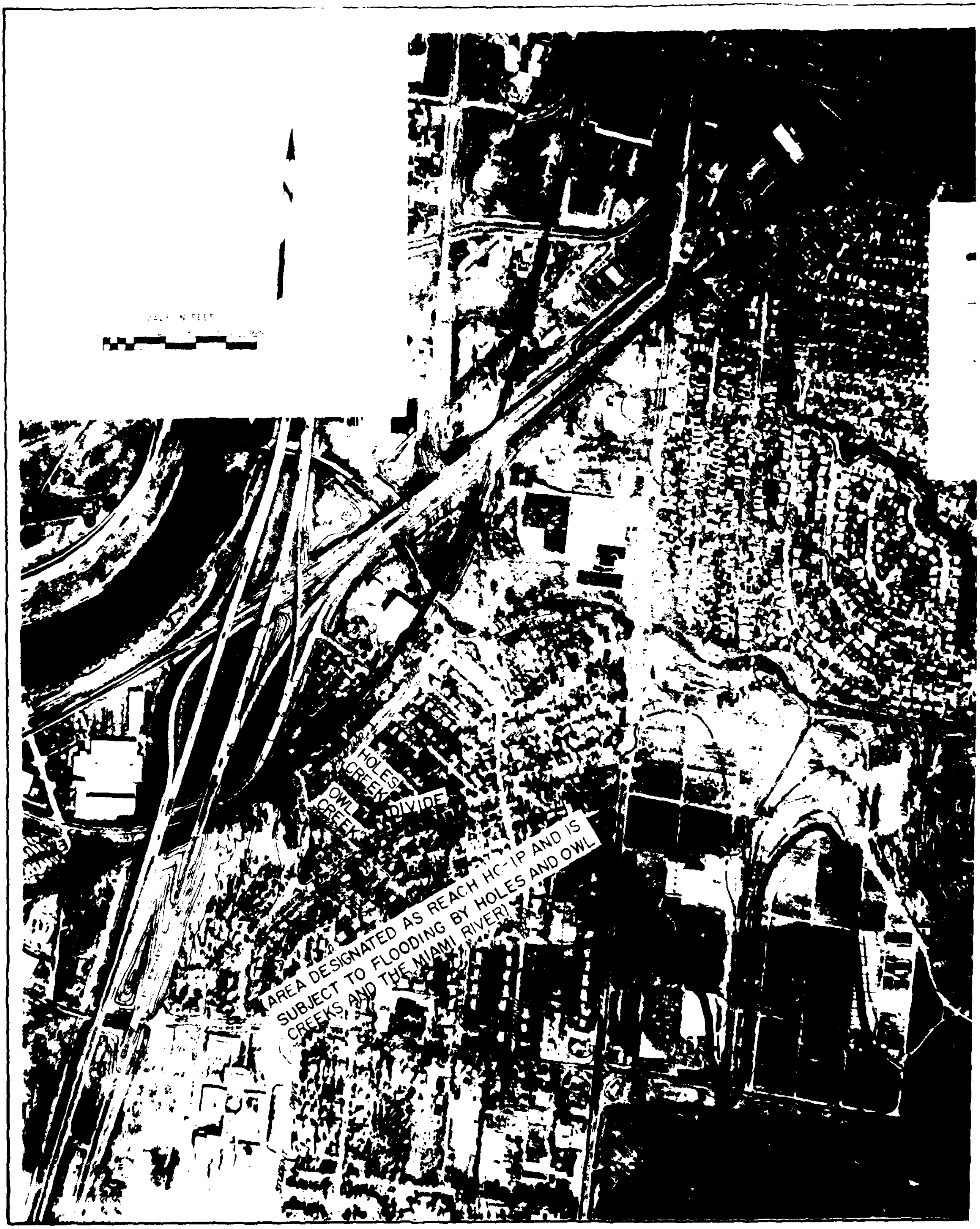
MIAMI RIVER BASIN

HOLES CREEK

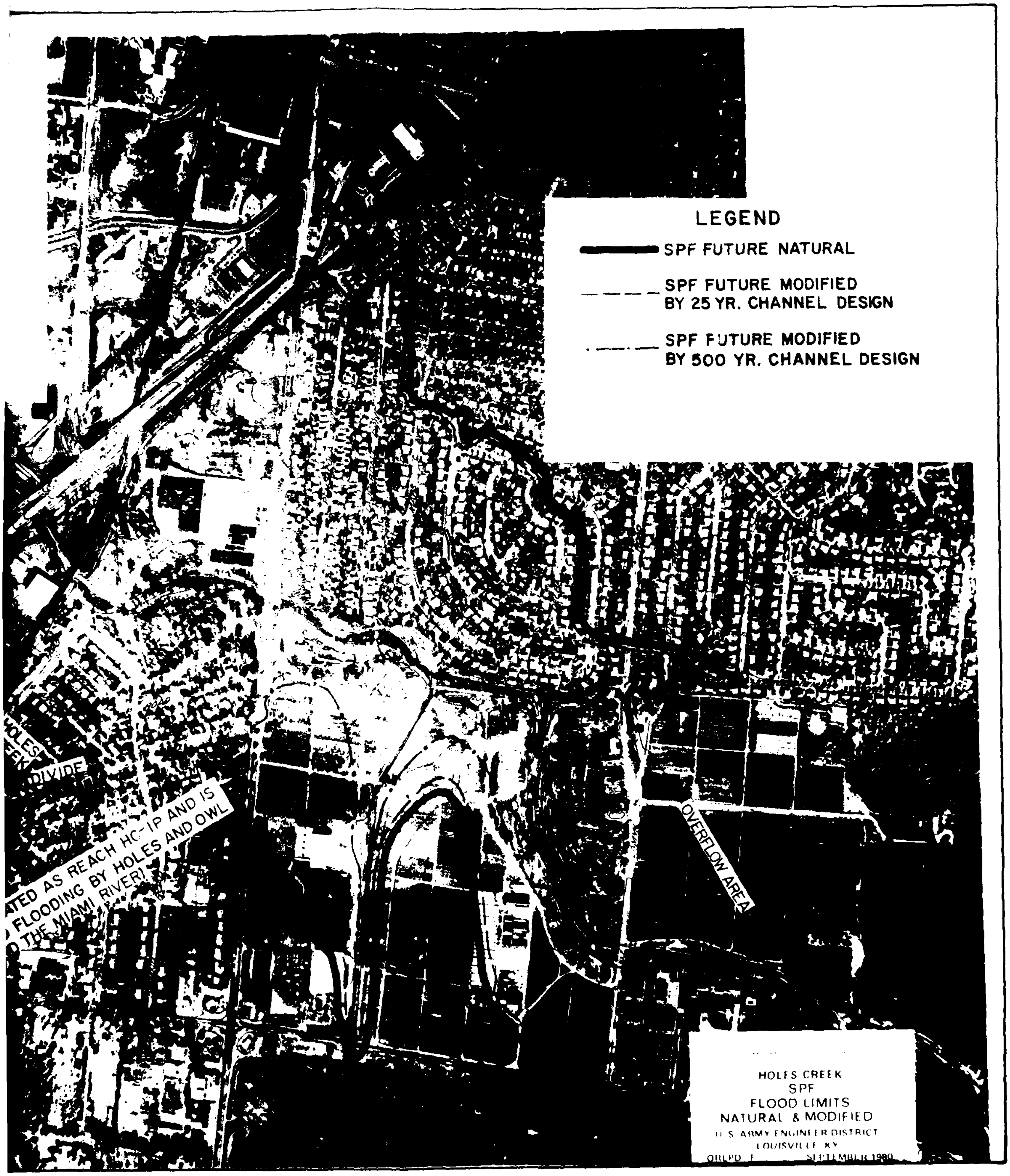
UTILITIES

U.S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY

ORLPD-F SEPTEMBER 1980



HOLES CREEK
OWL CREEK
DIVIDE
AREA DESIGNATED AS REACH HC-IP AND IS SUBJECT TO FLOODING BY HOLES AND OWL CREEKS AND THE MIAMI RIVER)



REV 20 MAR 81
PLATE B-1

HOLES CREEK, OHIO
INTERIM REPORT NO. 2

APPENDIX C

PUBLIC VIEWS AND RESPONSES

APPENDIX C
PUBLIC VIEWS AND RESPONSES

Table of Contents

Table of Contents (Cont.)

Section A

Public Involvement

Section A
Public Involvement

General

Public involvement is defined as active public participation for the purpose of determining study goals and objectives and aiding in plan formulation and evaluation. It involves: (a) making sure citizens are thoroughly familiar with how water and water-related problems are determined and solutions proposed; (b) continuously informing the public on study progress and implications; and (c) drawing opinions, perceptions, issues, objectives, information, and other forms of assistance from interested citizens relevant to each study stage. All three of the above objectives are met at each meeting with the public; however, emphasis on the different objectives would vary with the stage of study underway at the time of the meeting.

The public involvement program for this study is described below with comments on the objective emphasized at each meeting.

March 1968 - Initial Public Meeting

In March 1968, an initial public meeting for the parent study, Miami River, Little Miami River and Mill Creek Basins, Ohio, was held in nearby Dayton. About 100 people attended this meeting, which emphasized furnishing information on the study effort and obtaining views concerning water resource problems.

June 1975 - Coordination Meeting

This meeting was held in West Carrollton with local officials, MCD and Ohio representatives. The meeting was held to inform the attendees of the

initiation of the West Carrollton interim study and to invite comments on water resource problems in the area. Flooding along lower Owl and Holes Creeks was identified as the major water resource problem in the area.

November 1977 - Coordination Meeting

The meeting was held in West Carrollton with the same attendees represented as at the June 1975 meeting. The main purposes for this meeting were to inform the attendees of the status of the Corps' study and to invite comments on an array of potential solutions under study at that time. The attendees were in agreement with the plans being considered. Also, information was obtained concerning planned development in the upstream areas of Owl and Holes Creeks. This updated information terminated the consideration of upstream retarding structures.

September 1978 - Coordination Meeting

The meeting was held in West Carrollton with representatives from West Carrollton, Miami Township, Montgomery County, Miami Valley Regional Planning Commission, Miami Conservancy District, Ohio Department of Natural Resources and U.S. Fish and Wildlife Service. The main purpose of the meeting was to discuss the alternatives under consideration. Corps representatives explained the status of the study and recreation possibilities, and presented and explained the alternatives under consideration. The U.S. Fish and Wildlife Service representative discussed their preliminary findings. The salient comments received at this meeting included a desire for additional studies on Owl Creek, as no viable plans were formulated; a desire for any plan on Holes Creek to replace the Conrail Railroad bridge and to provide at least a 100-year level of protection; and concerns by local officials on the cost and policing of any recreational facilities/areas. Local officials were not interested in further development of recreation plans. Subsequent to the above meeting, planning for recreational facilities was terminated and a 10

year channel improvement plan was considered for Owl Creek, but found to be uneconomical.

December 1978 - Formulation Stage Public Meeting

A formal plan formulation public meeting was held on 14 December 1978 at West Carrollton High School. Approximately 3,000 public meeting announcements were mailed to Federal, State and local agencies and to the news media and residents in the study area. A brochure on the study was made available at this meeting. The presentation included past actions and studies that led up to the meeting and our findings concerning the problems and potential solutions. The main purpose of the meeting was to present to the public the alternatives for preventing flood damages and to obtain their views. Of the 65 to 70 persons in attendance, 5 to 6 objected to any type of flood control improvements in the area and an equal number encouraged continuation of the study. Local officials, represented primarily by the Miami Conservancy District (MCD), offered specific comments in support of the study in general and a channel improvement alternative. They also stated their objections to non-structural plans.

June 1980 - Final Public Meeting

The Final Public meeting was held in West Carrollton on 24 June 1980. Approximately 100 persons attended the meeting. Comments received varied from objections to any type of improvement, to full support of the selected plan. Local officials consisting of representatives from the Miami Conservancy District, City of West Carrollton, Miami Township and Montgomery County expressed agreement that flood control improvements were needed and that the selected

plan appeared to be the best plan. It was requested that recreation development be included. A petition was received at the meeting which had seventy names, of which, 53 stated they were against flood control improvements on Holes Creek.

Other Coordination

Section B of this Appendix contains pertinent written correspondence sent or received during the study. Also, several informal meetings and/or contacts occurred with U.S. Fish and Wildlife Service, Moraine, West Carrollton, Miami Township and Miami Conservancy District (MCD) representatives. The latest of these contacts were brief informal meetings with MCD representatives on 4 December 1979 and 12 June 1980 concerning the status of the study, and with Fish and Wildlife Service on 8 April 1980 and 1 August 1980. Section C of this Appendix contains written correspondence received as a result of review by others of the draft report and draft environmental impact statement. Corps of Engineers responses to the comments received are also displayed in Section C. It should be noted that the name of the railroad crossing lower Holes Creek was recently corrected in the report from Penn Central to Conrail, and that modifications have been made to the selected plan subsequent to review of the draft report and draft EIS. Although these changes are not significant, they are noted here to explain apparent discrepancies between data contained in the report and the exhibited correspondences.

Section B

Pertinent Correspondence

City of
West Carrollton

Edward L. Slonaker
City Manager

June 10, 1975

U. S. Army Engineer
Louisville District
P. O. Box 59
Louisville, Kentucky 40201

Gentlemen:

This letter is to officially request that the Corps of Engineers proceed with a study of the Hole's Creek and Owl Creek flooding problems and their possible solutions.

As you know, this area has flooded in past years due to a lack of capacity during periods of peak run-off into the two creeks mentioned above. Although good data is not available, it has been estimated that as many as [illegible] homes could be damaged by creek flooding under an adverse combination of frozen ground and heavy rains. Much of the capacity problem appears to be readily correctable by the elimination of specific bottlenecks. In this regard, it may be helpful to refer to The Miami Conservancy District preliminary report of November, 1961.

One other improvement not related to creek flooding but necessary for ground-water recharge is the reconstruction of the West Carrollton Dam which recently collapsed. This improvement could be accomplished simultaneously due to its proximity. (please refer to map)

I must emphasize that the city does not have the financial means to undertake these studies on its own, and certainly has no prospect of being able to finance the necessary construction which such a study might indicate. However, I can be confident in pledging the full cooperation of the city should you undertake this project.

With this letter, I have enclosed aerial photographs showing both creeks and the surrounding areas. As you will note, some areas are developed and some undeveloped. It should be noted that some of the undeveloped areas have been identified as appropriate for acquisition as limited development recreational facilities.

In exploring the potential for the Corps of Engineer's involvement in this project, I spoke with Mr. Al Thomas. Mr. Thomas was extremely helpful, and we welcome the availability of people of his caliber from your agency.

EXHIBIT 1
Sheet 1 of 2

U.S. Army Engineer

Page 2

June 10, 1975

In light of The Miami Conservancy District studies and as a result of our discussions with Mr. [illegible], we feel that Phase I of Appendix [illegible] of ER [illegible] (July 1974) has been substantially accomplished. We therefore would propose entering into Phase II, Step 4, which is "Assignment and Funding of Study." If this study is implemented, we believe that the [illegible] problems of these areas can be defined and that achievable solutions will become apparent. Some elements of these solutions may include replacement of restrictive structures over the creeks, levee work, and creek widening and straightening.

As you evaluate this request, I hope you will call on me if you have any questions or if further information would be helpful. This project carries the full support and intense interest of our elected officials, staff, The Miami Conservancy District and citizens. I am confident that working together, a very real improvement in the community can be accomplished.

Thank you very much for your consideration and interest.

Very truly yours,

Edward L. Slonaker

Edward L. Slonaker
City Manager

ELS:dk

encls.

EXHIBIT 1
Sheet 2 of 2

City of
West Carrollton

OFFICE OF THE
CITY MANAGER

November 22, 1977

Mr. Neal E. Jenkins, Chief
Planning Division
Department of the Army
District Corps of Engineers
Post Office Box 59
Louisville, Kentucky 402001

Dear Mr. Jenkins:

On Thursday, November 17, 1977, Roger Eckert and Ed Slonaker, members of my staff, attended a meeting with Mr. Al Thomas and Robert Stick of your staff, concerning Owl Creek and Holes Creek flooding problems. Mr. James Rozelle of Miami Conservancy District and Mr. Peter Finke of Ohio Department of Natural Resources were also present.

At that meeting, various problems and their possible solutions were discussed. Although the discussion was primarily concerning Owl Creek, they did discuss Allen Plat as he problems of that plat are related to Owl Creek and the Miami River as well.

The City of West Carrollton is extremely interested in this study and the eventual solution to our flooding problems. The possible funding has been explained and we see no problems with the local share as it was explained.

Thank you for your concern in this project. If we can answer any further questions or provide any other information, please contact me. Enclosed are two maps as requested by Mr. Thomas.

Very truly yours,

Tracy Williams

G. Tracy Williams
City Manager

bm
Encls.

EXHIBIT 2

41 East Central Avenue, West Carrollton, Ohio 45449. Phone (513) 859-5181

DAYTON, OHIO 45402
513 223-1271

WATER RESPONSI...

May 1, 1973

Board of Directors
WAL... A. RENTSCHLER
P...
... OELMAN
Vice President
ROGER THYER

Staff
L. BENNETT COY
General Manager & Secretary
WILLIAM T. EIFFERT
Chief Engineer Water Resources
JOHN P. FOX
Treasurer
EDYTHE M. LEWIS
Community Relations Director
W. JAY LINDER
Chief Engineer Flood Control & River Corridor
ROBERT E. REEMELIN
Assistant Secretary & Property Management

Legal Counsel
BRUMBAUGH, CORWIN & McDONNELL

Colonel Charles J. Fiala, District Engineer
Louisville District, Corps of Engineers
Department of the Army
P. O. Box 59
Louisville, Kentucky 40201

Dear Colonel Fiala:

The Board of Directors of this District has authorized me to advise the Corps of Engineers that this District is willing to become the local participating agency for local flood control projects within the Great Miami River Basin.

It is therefore suggested that we now meet, review each of the possible projects discussed and reviewed on prior occasions, and determine joint future steps to be taken from that point. In addition, actual degrees of protection would be discussed and, hopefully, agreed upon, so that several, if not all, of the local projects might be undertaken at an early date.

I would like to suggest that you advise of the specific Louisville District representatives with whom our personnel would be associated. This District will be represented by the undersigned, W. Jay Linder, Chief Flood Control Engineer, and James L. Rozelle, Senior Flood Control Engineer.

Early June, 1973 would, insofar as we are concerned, be a good and timely time to initiate the cooperative programs. Please advise of several dates and we will then attempt to select a suitable time and place.

This District looks forward to further cooperative efforts by and between these two agencies.

Very truly yours,

THE MIAMI CONSERVANCY DISTRICT

By: L Bennett Coy

L. Bennett Coy
General Manager

LBC:mmk
cc: Donald Williams

EXHIBIT 3

...E MIAMI CONSERVANCY DISTRICT
38 EAST MONUMENT AVENUE
DAYTON, OHIO 45402
513 223-1271

WATER
RESPONSIB

December 14, 1978

Colonel Thomas P. Nack
Corps of Engineers
Louisville District
P. O. Box 59
Louisville, KY 40201

Re: Holes Creek - Owl Creek

Dear Colonel Nack:

The Miami Conservancy District staff has reviewed the Stage II Interim Report for the Holes Creek - Owl Creek Watershed.

The report describes three alternate plans for flood protection on Holes Creek within study reaches 1 and 2, between Interstate 75 and Lamme Road. The following items represent the District staff comments on these three alternates:

1) Nonstructural Plan - The staff of the District believes that raising structures is not a viable option since it is felt this proposal would degrade the appearance of affected structures, would prove to be socially unacceptable by the residents and would result in only a 31 percent reduction in flood damages.

2) Right Bank Levee Plan - The District does not recommend implementation of this levee plan since it could well increase damage levels on the left bank, and would reduce flood damages by only 61 percent.

3) 100-Year Channel Improvement - The District staff recommends that this alternate be programmed for implementation, subject to consideration of the following modifications:

a) The project limits be extended upstream to Lamme Road. Work upstream from the end of the proposed channel could involve only right-of-way acquisition, limited clearing, snagging and shaping of the banks.

b) The operation, maintenance and replacement costs for the project be increased to at least $22,000/year.

c) The channel be designed to carry the 25% Meyers Flood, to meet minimum District channel design criteria.

d) Consideration be given to improving the waterway opening of the Penn Central Railroad Bridge.

The only economically feasible alternate on Owl Creek was a plan to raise structures and provide basement closures. For the same reasons given for the non-structural plan on Holes Creek, and as the project will reduce only 24 percent of flood damages, the District staff does not recommend further consideration of this alternate.

Enclosed are copies of resolutions from both the City Council of West Carrollton and the Montgomery County Commission requesting that the District continue to act as local sponsor on this project. It is therefore the intention of the District to continue in this capacity so long as there is a reasonable and economically viable project.

It is requested that this letter be included in the records of the public meeting, this date, and the comments contained herein be considered in any further studies.

Thank you for your consideration in this matter.

Very truly yours,

THE MIAMI CONSERVANCY DISTRICT

By:
Donald T. Williams
Chief Engineer

Enclosures

EXHIBIT 4
Sheet 3 of 3

THE MIAMI CONSERVANCY DISTRICT
38 EAST MONUMENT AVENUE
DAYTON, OHIO 45402
513 223-1271

WATER RESPONSIBILITY

May 8, 1979

Lt. Colonel Richard C. Bennett
Acting District Engineer
Corps of Engineers
Louisville District
P. O. Box 59
Louisville, KY 40201

Re: Holes Creek - Owl Creek

Dear Colonel Bennett:

This is in response to your letter of April 25, 1979 regarding the scope of the environmental impact statement for the Holes Creek - Owl Creek flood control project.

One of the issues that should be addressed in the assessment is the rapid urban development of both the Holes Creek and Owl Creek Watersheds. These drainage areas are two of the fastest growing areas in Ohio. The effect of this growth on flood peaks and water quality could be significant.

Another issue that should be considered is the impact on those residences, along Holes Creek between State Route 741 and Lamme Road, whose rear yards back up to the proposed channel and/or levee improvement.

Consideration should also be given to the impact of the removal of vegetation and tree cover along the natural creek banks and the subsequent replacement of this flora along the channel edge.

Other items on Holes Creek suggesting discussion would be the periodic removal of gravel along the existing creek, several bank scour problems which have been inspected by this office over the years, existing problems with the elevation of sanitary sewer crossings and drift removal at the Penn Central Railroad and State Route 741 bridges during flood events.

These are some of the areas which the District staff believes should be addressed in an environmental statement on Holes Creek.

Please contact this office if you require additional information.

Very truly yours,

THE MIAMI CONSERVANCY DISTRICT

By: Donald T. Williams
Donald T. Williams
Chief Engineer

EXHIBIT 5
Sheet 2 of 2

THE MIAMI CONSERVANCY DISTRICT
38 EAST MONUMENT AVENUE
DAYTON, OHIO 45402
513 223-1271

August 13, 1980

Colonel Thomas P. Nack
District Engineer
Corps of Engineers
Louisville District
P. O. Box 59
Louisville, KY 40201

Re: Holes Creek Project

Dear Colonel Nack:

This is in response to your letter of June 9, 1980 regarding the draft report for a flood protection project for Holes Creek downstream from Lamme Road.

The Miami Conservancy District staff has reviewed the main report, environmental impact statement and appendices. The District generally concurs with the recommendation that Plan D, the 500-year channel plan, be implemented. This plan equals the 25% Meyers design standard as proposed by this District in 1964 for channel improvements on tributary streams. Plan D will provide the maximum degree of protection to the largest number of properties while addressing the environmental concerns through the retention of one bank in a relatively natural condition, the construction of a series of riffles and pools, and by the preservation of several woodlots.

The staff also supports the concept of recreational improvements associated with the flood control project, particularly the bikeway concept. The proposed bikeway extending along the new channel from Lamme Road to the Miami River should be connected to the 14-mile South Montgomery County Bikeway, to provide a major bikeway access point for residents of the protected area.

The District staff acknowledges the references in the report to the President's proposed cost sharing policy and, should such policy be implemented, will attempt to obtain cooperation from the State of Ohio after the project is authorized by Congress. It should be noted, however, that in Ohio one legislative body cannot bind a succeeding legislature and that it will be necessary for any action by the State to be consummated just prior to initiation of construction.

The District staff encourages the Louisville District to complete final report preparation and obtain approvals from the Ohio River Division and Chief of Engineers at the earliest possible time so that the project can be included in the next public works bill before Congress. The serious flooding of this area in 1958, 1959, 1961 and 1963 has not been matched in recent years, but the problem still exists and in fact has been worsened by the continued development of the upstream drainage area, underway since the early 1960's. With each ensuing year, the chance of a major flood event increases, along with the potential for serious damages.

It is understood that subsequent to Congressional authorization and as a basis for the Corps to initiate construction, The Miami Conservancy District will be required to execute a formal local cooperation agreement. Subject to approval of an Official Plan by the District Board of Directors and Conservancy Court, The Miami Conservancy District would be legally and financially capable to accept the requirements of local cooperation as outlined below:

1) Local interests will provide cash or an in-kind contribution in lands, easements and rights-of-way equal to 20 percent of project first cost of flood damage prevention.

2) Pay, contribute in-kind, or repay with interest no less than one-half of the separable first cost of recreation.

3) Hold and save the United States free from damages due to the construction works, but not including damages due to the fault or negligence of the United States or its' contractors.

4) Operate and maintain all works after completion, including the recreational facilities constructed as a part of the project, in accordance with regulations prescribed by the Secretary of the Army and the aforementioned District Official Plan.

5) Administer and assure access to the recreational facilities and lands to all on an equal basis.

6) Prescribe and enforce regulations to prevent obstructions or encroachment on channels and ponding areas which would reduce their flood control purposes or hinder their operation and maintenance.

7) At least annually inform affected interests regarding the limitation of the protection afforded.

8) Comply with applicable provisions of (1) the Uniform Relocations Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646). and (2) Section 601, Title VI, of the Civil Rights Act of 1964 (Public Law 93-352).

Upon authorization of a project for construction by the Congress, The Miami Conservancy District staff is prepared to recommend acceptance and initiate the process required for Official Plan approvals which will allow the District to participate as the representative of the local political subdivisions and thereby provide the requirements of local cooperation. In this regard, please reference letters of agreement previously provided from the City of West Carrollton and Montgomery County along with the indication of interest to enter into similar agreements provided by Miami Township and the City of Moraine at the recent public meeting.

The Miami Conservancy District staff will continue to cooperate with the Louisville District in every possible way.

Very truly yours,

THE MIAMI CONSERVANCY DISTRICT

By:

L. Bennett Coy
General Manager

Miami Valley Regic
Planning Commission

May 14, 1979

Richard C. Bennett
LTC, Corps of Engineers
Acting District Engineer
Louisville District Corps of Engineers
P.O. Box 59
Louisville, Kentucky 40201

Dear LTC Bennett:

The water quality of Holes Creek would appear the most significant environmental issue of these projects. Presently, Holes Creek has the benefit of shading from tree cover. Following cannelization the stream will experience higher temperatures, lower dissolved oxygen and therefore lower biomass. The December, 1978 Public Information Brochure does not provide enough information concerning the channel improvement plan to make site specific mitigative recommendations. A method of "stream restoration" presented in Journal of Soil and Water Conservation, (Sept. - Oct. 1977) in an article entitled "Urban Streams" by E. A. Keller and E. K. Hoffman, would maintain the water quality of Holes Creek, as well as improve the public relations between AEC and citizens in West Carrollton. When site specific construction plans are developed, I would be more than happy to comment upon particular environmental problems.

Sincerely,

Richard Robertson

Richard Robertson
Environmental Planner

mm

EXHIBIT 7

ODNR
Ohio Department of Natural Resources

OFFICE OF OUTDOOR RECREATION SERVICES
F ... ntain Square • Columbus, Ohio 43224 • ...

May 22, 1979

LTC. Richard C. Bennett
Acting District Engineer
U.S. Department of the Army
Louisville District, Corps of Engineers
P.O. Box 59
Louisville, Kentucky 40201

RE: West Carrollton Local Flood Protection Project

Dear Mr. Bennett:

Please reference the April 25, 1979 letter from your agency to the Department of Natural Resources.

Attached is a list of issues which the Department of Natural Resources feels should be addressed in the forthcoming draft environmental impact statement (Draft EIS) for the West Carrollton Local Flood Protection Project.

Divisions within the Department can provide technical assistance and information needed for the preparation of the Draft EIS. If you need information or technical assistance please contact this Office (Michael Colvin, Environmental Review Coordinator, 466-8387) or Bob Lucas, Corps of Engineers Liaison.

We appreciate the opportunity to participate in the scoping process initiated for the Draft EIS.

Sincerely,

Roger D. Hubbell, Assistant Chief
Office of Outdoor Recreation Services

RDH:sjd

cc: Bob Lucas

EXHIBIT 8
Sheet 1 of 2

ODNR

Ohio Department of Natural Resources

OFFICE OF OUTDOOR RECREATION SERVICES
Fountain Square • Columbus, Ohio 43224 • 614-466-4974

May 22, 1979

CHANNEL IMPROVEMENT PROJECT,
WEST CARROLLTON, OHIO
(Louisville District, Corps of Engineers)

The following are issues which the Ohio Department of Natural Resources considers to be significant and which should be addressed in the forthcoming environmental statement:

1. Compatibility of the improvement with other existing or proposed public works projects in the area.

2. Outdoor recreational impacts or opportunities which would result from project completion.

3. Impacts of the project on terrestrial and aquatic fauna. Effectiveness of proposed mitigation features.

4. Effects of project on terrestrial and aquatic flora. Effectiveness of proposed mitigation features.

5. Location and future use of borrow areas. Feasibility of using borrow areas for stormwater retention basins.

6. Identification of soil types and characteristics with respect to revegetation success.

7. Vegetative manipulation and revegetation associated with erosion control and restoration of vegetation cover.

8. Possible effects of increased flows on downstream areas.

9. Effect of structural measures, including channel modification and small reservoirs, on a stream's natural ability to ameliorate polluted conditions. Will changing the morphology of an existing stream channel result in a compounding of the effect of existing degraded water quality?

EXHIBIT 8
Sheet 2 of 2

STATE CLEARINGHOUSE

30 EAST BROAD STREET • 24TH FLOOR • COLUMBUS, OHIO 43215 • 614/466-7461

A

79-01-16

04

District Engineer
U.S. Army Engineer District, Louisville
P.O. Box 59
Louisville, Kentucky 40201

RE: State Clearinghouse A-95 Review
Project Title: Water Resources Development - Montgomery Co. - West Carrollton, Ohio

SAI Number: 35-422-0018 Federal Catalog Number: N/A
Proposed Federal Funding: N/A

Dear Applicant:

The State Clearinghouse has reviewed the project notification information for the above referenced project to be assisted by federal funding. The results of the review are as follows:

_____ After review by interested state agencies, it has been determined that the proposal is not inconsistent with State Plans, programs, and objectives.

_____ After review by interested state agencies, it has been determined that the proposal is not inconsistent with State Plans, programs, and objectives. We are, however, attaching comments from state agencies which should be taken into consideration as you continue with the development of your funding request.

_____ After review by interested state and local agencies, it has been determined that the proposal is not inconsistent with State or local plans, programs, and objectives.

__XX__ After review by interested state and local agencies, it has been determined that the proposal is not inconsistent with State or local plans, programs, and objectives. We are, however, attaching comments from state and/or local agencies which should be taken into consideration.

EXHIBIT 9
Sheet 1 of 6

Note the State Applicant Identifier Number -- this must appear as Item #3 on federal form SF424, a federally required transmittal sheet which must accompany your federal grant application.

Taking the above into consideration, and upon receipt of comments from an areawide clearinghouse, if required, we recommend that you proceed with your application to the appropriate federal funding agency.

Sincerely,

Judith Y. Brachman

Judith Y. Brachman
Administering Officer
STATE CLEARINGHOUSE

STATE CLEARINGHOUSE TRANSMITTAL FORM

The attached project has been submitted to the State Clearinghouse under the provisions of the Federal OMB Circular A-95 (Revised). This form provides ... opportunity for review of this project to the agencies checked below. ... Part II and Part III below ... return to the State ... In the event that this form is not returned by the date indicated, the State Clearinghouse will assume that the agency has waived the right ...

Date Review Started	Date Review Ended	S.A.I. Number	Fed. Catalog No.
78-12-15		35-422-0018	N/A

PART I - Initial Project Notification Review (completed by State Clearinghouse)

Return no later than: Jan 9, 1979

☐ Notice of intent. ☑ Final Application. ☐ Full App. available at S.C.H., please request within 5 days.

Review Agencies

TO:		RETURNED:	TO:		RETURNED:
☐	Department of Public Welfare	☐	☐	Rehabilitation & Correction	☐
☑	Department of Transportation	☐	☑	Ohio Historical Society	☐
☑	Ohio Department of Health	☐	☐	Mental Health & Mental Retardation	☐
☑	Department of Natural Resources	☐	☐	Economic & Community Development	☐
☑	Ohio Environmental Protection Agency	☐	☐	Regional Planning Organization	☐
☐	Ohio Youth Commission	☐	☑	Areawide Agency MVRPC ☐ acknowledged ☐ by app.	☐
☐	Ohio Civil Rights Commission	☐	☑	Health Systems Agency MVHSA	☐
☐	Other	☐	☐	Other	☐
☐	Other	☐			

PART II - Nature of Agency Review Comments (to be completed by review agency)

Check one or more appropriate boxes:

Consistent with agency review criteria?

Yes

No

☐ Request additional information.

☐ Suggestions for improving the project are attached.

Comments (attach additional sheet if necessary - please type or print clearly.)

Direct Federal Development

If a structural measure is chosen as the alternative to be implemented, then an EIS may be required by the Corps of Engineers. The project can have adverse environmental effect and these possibilities need to be investigated.

Contact: Carl Wilhelm
Environmental Protection Agency
361 East Broad St.
Columbus, Ohio 43215
(614) 466-8866

RECEIVED

PART III- ... (completed by review agency.)
N... red only if comments are to be included in clearance letter.

Check one box only

☐ Clearance of the project should be granted.

☐ Clearance of the project should be delayed until the issues or questions indicated have been clarified by the applicant.

☐ No further interest or comments

☒ Request opportunity to review the environmental impact Statement / Assessment.

☒ Clearance of the project should not be delayed but applicant should address or clarify the questions or concerns indicated.

☐ Request the opportunity to review the final application prior to submission to the federal funding agency.

EXHIBIT 9
Sheet 3 of 6

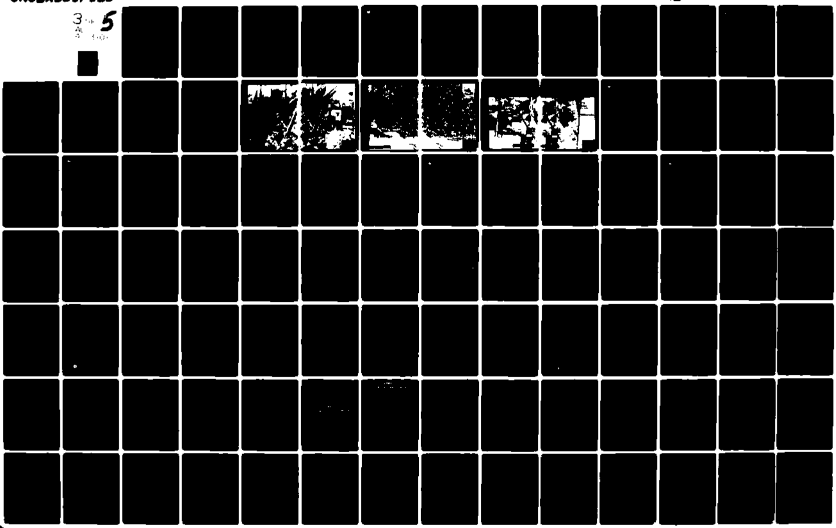
Reviewer's Name	Executive or Deputy Director Sign off	Agency	Date
		OEPA	

OHIO STATE CLEARINGHOUSE

AD-A113 101 ARMY ENGINEER DISTRICT LOUISVILLE KY F/G 13/2
HOLES CREEK, WATER RESOURCES DEVELOPMENT. VOLUME 2. APPENDICES.(U)
SEP 80

UNCLASSIFIED NL

3 of 5



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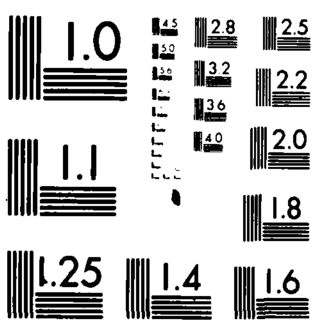

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

The attached project has been submitted to the State Clearinghouse under the provisions of the F[illegible] cular A-95 Revised. This form provides notification and opportunity for review of this [illegible] ect to the agencies checked below. Please fill in [illegible] Part III below and return to the State Clearinghouse. In the event that this form is not returned by the date indicated, the State Clearinghouse will assume th[illegible] the agency has waived the right to comment.

D[illegible]ew Started:	Date Review Ended:	S.A.I. Number:	Fed. Catalog No.:
78-12-15		35-422-0018	N/A

PART I - Initial Project Notification Review (completed by State Clearinghouse)

Return no later than: Jan 9, 1979

☐ Notice of intent. ☑ Final Application. ☐ Full App. available at S.C.H., please request within 5 days.

Review Agencies

TO:		RETURNED:	TO:		RETURNED:
☐	Department of Public Welfare	☐	☐	Rehabilitation & Correction	☐
☑	Department of Transportation	☐	☑	Ohio Historical Society	☐
☑	Ohio Department of Health	☐	☐	Mental Health & Mental Retardation	☐
☑	Department of Natural Resources	☐	☑	Economic & Community Development	☐
☑	Ohio Environmental Protection Agency	☐	☐	Regional Planning Organization	☐
☐	Ohio Youth Commission	☐	☑	Areawide Agency MVRPC	☐
☐	Ohio Civil Rights Commission	☐		☐ acknowledged ☐ by app.	
☐	Other	☐	☑	Health Systems Agency MVHSA	☐
☐	Other	☐	☐	Other	☐

PART II - Nature of Agency Review Comments (to be completed by review agency)

Check one or more appropriate boxes:

Consistent with agency review criteria?

☐ Yes

☐ No

☒ Request additional information.

☒ Suggestions for improving the project are attached.

C[illegible]nts (attach additional sheet if necessary - please type or print clearly.)

Direct Federal Development

Comments on this project were sent directly to the applicant (see attached). Both a history-architecture survey and an archaeological survey were recommended of all lands to be disturbed, including borrow and spoil areas.

PART III - Recommended State Clearinghouse Action (To be completed by review agency.)

NOTE: Executive or Deputy Director Sign-off required only if comments are to be included in clearance letter.

Check one box only

☐ Clearance of the project should be granted.

☐ Clearance of the project should be delayed until the issues or questions indicated have been clarified by the applicant.

☐ No further interest or comments

☐ Request opportunity to review the environmental impact Statement / Assessment.

☒ Clearance of the project should not be delayed but applicant should address or clarify the questions or concerns indicated.

☐ Request the opportunity to review the final application prior to submission to the federal funding agency.

[illegible] 20 1978

EXHIBIT 9

Sheet 4 of

(614) 466-1500-ex 266

Reviewer's Name	Executive or Deputy Director Sign-off	Agency	Date
[signature]	[signature]	Ohio Historic Preservation Office Ohio Historical Center I-71 and 17th Avenue	DEC 18 1978

STATE CLEARINGHOUSE TRANSMITTAL FORM

The attached project has been submitted to the State Clearinghouse under the provisions of the Federal OMB Circular A-95 Revised. This form provides ... opportunity for review of this project to the agencies checked below. Please fill in Part II and Part III below and return to the State ... In the event that this form is not returned by the date indicated, the State Clearinghouse will assume that the agency has waived the right to ...

Date Review Started: 78-12-15	Date Review Ended:	S.A.I. Number: 35-422-0018	Fed. Catalog No.: N/A

PART I - Initial Project Notification Review (completed by State Clearinghouse.)

Return no later than: Jan 9, 1979

☐ Notice of intent. ☑ Final Application. ☐ Full App. available at S.C.H., please request within 5 days.

Review Agencies

TO:		RETURNED:	TO:		RETURNED:
☐	Department of Public Welfare	☐	☐	Rehabilitation & Correction	☐
☑	Department of Transportation	☐	☑	Ohio Historical Society	☐
☑	Ohio Department of Health	☐	☐	Mental Health & Mental Retardation	☐
☑	Department of Natural Resources	☐	☐	Economic & Community Development	☐
☑	Ohio Environmental Protection Agency	☐	☐	Regional Planning Organization	☐
☐	Ohio Youth Commission	☐	☑	Areawide Agency MVRPC	☐
☐	Ohio Civil Rights Commission	☐		☐ acknowledged ☐ by app.	
☐	Other	☐	☑	Health Systems Agency MVHSA	☐
☐	Other	☐	☐	Other	☐

OHIO STATE CLEARINGHOUSE

PART II -Nature of Agency Review Comments (to be completed by review agency)

Check one or more appropriate boxes:

Consistent with agency review criteria?

☐ Yes

☐ No

☐ Request additional information.

☐ Suggestions for improving the project are attached.

Comments (attach additional sheet if necessary - please type or print clearly.)

Direct Federal Development

If a structural measure is choosen as the alternative to be implemented, then an EIS may be required by the Corps of Engineers. The project can have adverse environmental effects and these possibilities need to be investigated.

Contact: Carl Wilhelm
Environmental Protection Agenc
361 East Broad St.
Columbus, Ohio 43215
(614) 466-8866

RECEIVED
JAN 1 1979

PART III - ... (completed by review agency.) ...red only if comments are to be included in clearance letter.

Check one box only

☐ Clearance of the project should be granted.

☐ Clearance of the project should be delayed until the issues or questions indicated have been clarified by the applicant.

☐ No further interest or comments

☒ Request opportunity to review the environmental impact Statement / Assessment.

☒ Clearance of the project should not be delayed but applicant should address or clarify the questions or concerns indicated.

☐ Request the opportunity to review the final application prior to submission to the federal funding agency.

EXHIBIT 9
Sheet 3 of 6

Reviewer's Name	Executive or Deputy Director Sign-off	Agency	Date
		OEPA	8 Jan 1979

Miami River
5-464-311-3

December 12, 1978

District Engineer
U.S. Army Engineering District, Louisville
P. O. Box 59
Louisville, Kentucky 40201

Re: West Carrollton, Ohio
Water Resources Development

Dear Sir:

The Ohio Historic Preservation Office received a copy of the Public Information Brochure for the above referenced project on December 8, 1978. As State Historic Preservation Officer I am responsible for the development and implementation of a comprehensive State Historic Preservation Plan. In partial fulfillment of these responsibilities my staff reviews all Federal undertakings which might affect cultural resources (properties of archaeological, historical or architectural significance) in accordance with the National Historic Preservation Act of 1966 (P.L. 89-665), the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order 11593 (Protection and Enhancement of the Cultural Environment).

Pages 17 and 20 of the brochure state that the only cultural resources that would be affected by any of the plans is the Joseph Dryden Mill Site (not Hyden). You also state that "further consideration of all sites will be given in Stage III as plans are modified and refined." The number of historic and archaeological sites inventoried by our Regional Preservation Office System grows every day. Please note the enclosed Technical Bulletin prepared by the Montgomery-Green County Transportation Coordinating Committee. There are 1356 historic sites listed for Montgomery County and 408 archaeological sites, and that was as of June 30, 1978.

The Nonstructural Measures have the potential to affect buildings that may be significant in history or architecture. The Structural Measures such as levees, reservoirs, floodwalls and channelization could all affect as yet unknown archaeological resources and may necessitate the relocation of potentially significant residences and businesses. For these reasons I recommend that your Stage III consideration of all sites include both a history-architecture survey of areas to be affected and an archaeological survey of all lands to be disturbed, including borrow and spoil areas.

EXHIBIT 9
Sheet 5 of 6

Ohio Historic Preservation Office
Ohio Historical Center I-71 & 17th Avenue Columbus, Ohio 43211 (614) 466-1500

The surveys are necessary to fulfill your Executive Order 11593 responsibility and to comply with the Advisory Council's procedures codified at 36 CFR 800.4(a). A copy of the survey reports should be submitted to this office for review and comment upon completion. We look forward to continued coordination on the Holes Creek and Owl Creek flood protection project.

Sincerely,

Thomas H. Smith
State Historic Preservation Officer
Director, Ohio Historical Society

THS:BCD:cw

X. c: Jack Goldstein, ACHP

enclosure

STATE CLEARINGHOUSE

30 EAST BROAD STREET • 24TH FLOOR • COLUMBUS, OHIO 43215 • 614/466-7461

79-01-23 A

District Engineer
U.S. Army Engineer District, Louisville
P.O. Box 59
Louisville, Kentucky 40201

RE: State Clearinghouse A-95 Review
Project Title: Water REsources Development - Montgomery Co.
State Application Identifier Number (SAI): 35-422-0018

Dear Applicant:

Our office has recently notified you that the A-95 review has been completed with respect to the above referenced project and recommended that you proceed with an application to the appropriate federal funding agency.

We have now received additional comments from a reviewing agency which we believe should be taken into consideration as you proceed with the application process. (see attached)

If you have any questions concerning the above, please contact our office, (614) 466-7461.

Sincerely,

Judith Y. Brachman

Judith Y. Brachman
Administering Officer
STATE CLEARINGHOUSE

EXHIBIT 10
Sheet 1 of 3

[illegible] project has been submitted to the S[illegible] Clearinghouse under the provisions of the [illegible] Circular A-95 Revised. This form provides [illegible] opportunity for review of this pr[illegible] to the agencies checked below. Please fill in Part II and Part III [illegible] return to the State [illegible]house. In the event that this form is not returned by the date indicated, the State Clearinghouse will assume that the agency has waived the right [illegible]mment.

Review Started:	Date Review Ended:	S.A.I. Number:	Fed. Catalog No.:
78-12-15		35-422-0018	N/A

PART I - Initial Project Notification Review (completed by State Clearinghouse.)

Return no later than: Jan 9, 1979

[ ] Notice of intent. [x] Final Application. [ ] Full App. available at S.C.H. please request within 5 days

Review Agencies

TO:		RETURNED:	TO:		RETURNED:
[ ]	Department of Public Welfare	[ ]	[ ]	Rehabilitation & Correction	[ ]
[x]	Department of Transportation	[ ]	[x]	Ohio Historical Society	[ ]
[x]	Ohio Department of Health	[ ]	[ ]	Mental Health & Mental Retardation	[ ]
[x]	Department of Natural Resources	[ ]	[ ]	Economic & Community Development	[ ]
[x]	Ohio Environmental Protection Agency	[ ]	[ ]	Regional Planning Organization	[ ]
[ ]	Ohio Youth Commission	[ ]	[x]	Areawide Agency MVRPC	[ ]
[ ]	Ohio Civil Rights Commission	[ ]		[ ] acknowledged [ ] by app.	
[ ]	Other	[ ]	[x]	Health Systems Agency MVHSA	[ ]
[ ]	Other	[ ]	[ ]	Other	[ ]

PART II -Nature of Agency Review Comments (to be completed by review agency)

Check one or more appropriate boxes:

Consistent with agency review criteria?

[ ] Yes

[ ] No

[x] Request additional information.

[ ] Suggestions for improving the project are attached.

C[illegible]nts (attach additional sheet if necessary - please type or print clearly.)

Direct Federal Development

See Attached

RECEIVED
JAN 23 1979
STATE CLEARING HOUSE
OFFICE OF THE GOVERNOR

PART III- Recommended State Clearinghouse Action (To be completed by review agency.)
NOTE: Executive or Deputy Director Sign-off required only if comments are to be included in clearance letter.

Check one box only

[ ] Clearance of the project should be granted.

[ ] Clearance of the project should be delayed until the issues or questions indicated have been clarified by the applicant.

[ ] No further interest or comments

[ ] [illegible]quest opportunity to review the environmental impact Statement / Assessment.

[x] Clearance of the project should not be delayed but applicant should address or clarify the questions or concerns indicated.

[ ] Request the opportunity to review the final application prior to submission to the federal funding agency.

EXHIBIT 10
Sheet 2 of 3

Reviewer's Name	Executive or Deputy Director Sign-off	Agency	Date
[illegible]	[illegible]	ODNR [illegible]	12/[illegible]/78

[illegible] FORM - 8

OHIO STATE CLEARINGHOUSE

30 East Broad Street, 24th floor
Columbus, Ohio 43215 (614) 466-7461

ODNR
Ohio Department of Natural Resources
Fountain Square · Columbus, Ohio 43224 · (614) 466-3770

January 19, 1979

TO: Judith Y. Brachman, Administering Officer
State Clearinghouse

FROM: Jennifer McSweeney
Land Use Coordinator

SUBJECT: SAI # 35-422-0018 (West Carrollton, Water Resources Development)

The above cited Public Information Brochure has been reviewed within the Department.

It should be noted that the environmental quality of the Holes Creek area is adequate to support healthy, diverse populations of forage fish and also some sport fish. During the spring of 1979 the U.S. Fish and Wildlife Service is to conduct a fishery survey and they are to submit a draft report in reference to the project area by July 1, 1979. The District 5 office of the Division of Wildlife agrees that such a field survey should be completed and that Holes Creek should be protected as a fisheries nursery area. This stream reach presently serves as an open space and outdoor recreation area (there is evidence of some fishing use) and project plans should consider the preservation of these values.

If you have any questions, please contact Eric Angle, Division of Wildlife, (614) 466-3558.

cc: Eric Angle

EXHIBIT 10
Sheet 3 of 3

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST
CHICAGO ILLINOIS 60604

1 AUG 1979

Mr. Richard C. Bennett
LTC, Corps of Engineers
Acting District Engineer
U.S. Army Engineer District, Louisville
P. O. Box 59
Louisville, Kentucky 40201

Dear Mr. Bennett:

We have reviewed the brochure submitted with your letter of April 25, 1979, requesting our views concerning issues that should be addressed in an environmental impact statement on flood control along Holes Creek and Owl Creek in the vicinity of West Carrollton, Ohio. Based on the limited amount of information available from the brochure, we believe that the following issues are of major significance and should be considered and assessed for their potential impact upon the environment.

1. Potential for adverse secondary impacts, including downstream flooding.

2. Impacts on stream quality due to proposed removal of trees and other vegetation along the channel.

3. The project's compliance with U.S. Army Corps of Engineers proposed rules on use of non-structural measures in planning for flood damage reduction should be noted. Discussion of local flood plain ordinances and other measures to control future development in the flood plain should be included.

4. The future land-use pattern map indicates increased urban development in the area. Will the project induce development, creating or exacerbating environmental problems in other reaches of the river and streams?

Thank you for affording us the opportunity to comment on the subject document. If you or your staff have any question concerning our comments please contact Ms. Arlene Kaganove at 312/353-2307.

Sincerely yours,

Arlene Kaganove

for Barbara J. Taylor
Environmental Impact Statement
Office of Federal Activities

EXHIBIT 11

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

East Lansing Area Office
1405 South Harrison Road
East Lansing, Michigan 48823

SEP 28 1978

Colonel Thomas P. Nack
District Engineer
U.S. Army Engineer District
Louisville
Post Office Box 59
Louisville, Kentucky 40201

Dear Colonel Nack:

This is our preliminary report on the fish and wildlife aspects of the proposed local flood prevention project at West Carrollton, Ohio as requested in your letters of October 18, 1977 and April 17, 1978. This report has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C., 661 et seq.).

Field investigations were made of the study area on several occasions by Service biologists. Fishery resource data were obtained by using an electrofishing devise on two occasions during the summer 1978. Observations were also made on the riparian habitat along and adjacent to Holes Creek and Owl Creek.

Holes Creek is a tributary of the Great Miami River at River Mile 72.5. The stream reach proposed for flood control measures extends from its confluence with the Great Miami River to approximately one mile upstream. Included in this reach is the downstream portion recently channelized due to construction of the interstate highway. Upstream from the Penn Central Railroad to Lamme Road, Holes Creek is protected with almost continuous canopy of streambank vegetation. Common species include sycamore, cottonwood, mulberry, hackberry, boxelder, American elm, black locust, black willow, silver maple, green ash, black walnut and Ohio buckeye. Dominant shrubs and vines are dogwood and grape, respectively. This woody vegetation along with herbaceous species provides good habitat for a variety of songbirds and small mammals. In addition, the overhanging vegetation is a major contributor to the aquatic food chain, as well as providing shade, thus limiting maximum water temperatures.

The stream substrate in the study area varies from silty-sand to gravel. Several pool-riffle complexes exist in the reach from Penn Central Railroad to Lamme Road. The stream habitat supports a viable community of fishes. Fish species collected in July 1978 include creek chub, stoneroller, bluntnose minnow, white sucker, green sunfish, bluegill, Johnny darter and fantail darter. Upstream from Lamme Road we collected several hogsuckers and a 10-inch smallmouth bass in addition to the above species. During our survey we saw evidence of fisherman use along the stream. Holes Creek also has a large population of crayfish, which are important detritivors in the stream ecosystem. Amphibians and reptiles utilize the stream, as well as a limited fur bearer population (muskrat).

Water quality of Holes Creek appears to be adequate to support a healthy, diverse population of forage fish and limited sport fish. We observed numerous schools of young-of-year minnows which indicate that the stream provides important nursery habitat for forage fishes. During high water conditions many of these fish are flushed into the Great Miami River where they become prey for game fish, turtles, and birds such as great blue herons and belted kingfishers.

Owl Creek is a tributary ot the Great Miami River at River Mile 68.5. The area proposed for flood control measures includes 4,500 feet of Owl Creek and 3,000 feet of Primrose Tributary, both of which have been totally channelized in the past. Nevertheless, the portion of Owl Creek from Central Avenue to its confluence, and most of Primrose Tributary have excellent riparian habitat providing a continuous canopy over the stream. We observed numerous songbirds species in these areas during our field surveys. Vegetation along Owl Creek and its tributary is similar to Holes Creek and therefore, provides basically the same food and cover to wildlife. The major differences are that Owl Creek and Primrose Tributary are intermittent streams, and Owl Creek receives grossly polluted effluent from a paper mill in West Carrollton. Consequently, little or no aquatic life was observed in the stream.

As a result of our preliminary studies, we believe the resources of the Owl Creek area can be easily replaced, should you develop alternatives which would destroy those resources. However, the fishery resources of Holes Creek appear significant and should be studied further. Before any analysis of the impact of project alternatives on the Holes Creek area can be made, it will be necessary for us to conduct fishery surveys during the spring.

These surveys can be made within the proposed FY 1979 funding levels established for this project. However, your letter of 17 April, 1978, indicates that you desire our draft Fish and Wildlife Coordination Act Report by March 1979. Since the fishery surveys are prerequisite to the analysis of alternative impacts on Holes Creek, it appears that the earliest date that a draft report on this project area could be submitted is July 1, 1979. Therefore, we recommend that we further coordinate the reporting requirements for this project at an early date.

Sincerely yours,

Raymond G. Obert

Act'g Area Manager

cc: Regional Director, FWS, Twin Cities, MN (LWR)
ODNR, Div. of Wildlife, Columbus, OH
Supervisor, FWS, CFO, Pickerington, OH

United States Department of the Interior
FISH AND WILDLIFE SERVICE
IN REPLY REFER TO:
East Lansing Area Office
Manly Miles Building, Room 202
1405 South Harrison Road
East Lansing, Michigan 48823

Colonel Thomas P. Nack
District Engineer
U. S. Army Engineer District
Louisville
Post Office Box 59
Louisville, Kentucky 40201

Dear Colonel Nack:

This is our draft report on the fish and wildlife aspects of the proposed local flood protection project at West Carrollton, Ohio as requested in your December 20, 1978, letter. This report has been prepared under the authority of and in accordance with the provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C., 661 et seq.).

Flood control measures are proposed for Holes Creek and Owl Creek watersheds in the community of West Carrollton, Ohio. Economically feasible alternatives under consideration include channel improvement for conveyance of flood waters on Holes Creek, a right bank levee along Holes Creek, and nonstructural alternatives. As a result of a recent public meeting, channel improvement alternatives for Holes Creek are extended to Lamme Road. A ten-year channel design for Owl Creek from Alexandersville Road to Central Avenue and a 500-year channel design for Holes Creek are presently under consideration for their economic feasibility.

Holes Creek is a tributary of the Great Miami River at River Mile 72.5. The stream reach proposed for flood control measures extends from the I-71 ramp, approximately 500 feet from its confluence with the Great Miami River, to approximately 6000 feet upstream. The downstream portion of the stream corridor from its confluence to approximately 200 feet upstream from the Penn Central Railroad is devoid of continuous streambank vegetation. Upstream from that point to Lamme Road, Holes Creek is protected with almost continuous canopy of streambank vegetation. Common species include sycamore, cottonwood, mulberry, hackberry, boxelder, American elm, black locust, black willow, silver maple, green ash, black walnut and Ohio buckeye. A few large sycamore, hackberry, and cottonwood are hollow and potentially used by wood ducks, owls, and raccoon. However, most of the trees along the stream corridor are too small to provide good den habitat. Dominant shrubs and vines are dogwood and grape, respectively. This woody vegetation along with herbaceous species provides the necessary habitat for a variety of songbirds and small mammals. In addition, the overhanging vegetation is a major contributor to the aquatic food chain, as well as providing shade, thus limiting maximum water temperatures.

The stream substrate in the study area varies from silty-sand to gravel. Several pool-riffle complexes exist in the reach from Penn Central Railroad to Lamme Road. The stream habitat supports a viable community of fishes. Fish species collected in July 1978 include creek chub, stoneroller, bluntnose minnow, white sucker, green sunfish, bluegill, johnny darter and fantail darter. Upstream from Lamme Road we collected several hogsuckers and a 10-inch smallmouth bass in addition to the above species. During our survey we noted evidence of fisherman use along the stream. We have estimated 200 man-days per year fisherman use of Holes Creek in the project area. Most of the fishing is done by local youngters.

Water quality of Holes Creek appears to be adequate to support a healthy, diverse population of forage fish and limited sport fish. We observed numerous schools of young-of-year minnows which indicate that the stream provides important nursery habitat for forage fishes. During high water conditions many of these fish are flushed into the Great Miami River where they become prey for game fish, turtles, and birds such as herons and kingfishers. Holes Creek also has a large population of crayfish, which are important detritivors in the stream ecosystem. Amphibians and reptiles commonly found in the area utilize the stream, as well as a limited fur bearer population (muskrat and raccoon).

A spring fishery survey is presently being conducted on the project area of Holes Creek. The results and recommendations of this survey will be included in our supplementary letter by July 1, 1979, as previously agreed. The initial sampling in the project reach included three additional species; carp, common shiner, and hog sucker. An esocdid (pike) species was observed, but not captured.

Owl Creek is a tributary of the Great Miami River at River Mile 68.5. The area proposed for flood control measures includes 4,500 feet of Owl Creek and 3,000 feet of Primrose Tributary, both of which have been channelized in the past. Nevertheless, the portion of Owl Creek from Central Avenue to its confluence, and most of Primrose Tributary have excellent riparian habitat which provides a continuous canopy over the stream. We observed numerous songbirds species in these areas during our field surveys. Vegetation along Owl Creek and its tributary is similar to Holes Creek and therefore, provides basically the same food and cover to wildlife. The major differences are that Owl Creek and Primrose Tributary are intermittent streams, and Owl Creek receives grossly polluted effluent from a paper mill in West Carrollton. Consequently, little or no aquatic life was observed in the stream.

We understand that some alternatives are still being developed and tested for economic feasibility by the Corps. The latest information we have indicates that channel work to Lamme Road will be included for channel improvement alternatives. Previous plans would have ended channel modifications approximately 4200 feet upstream from the I-71 ramp. The new proposal would include an additional 2,000 feet of stream work. In addition to 25-year, 50-year, and 100-year channel designs, we understand a 500-year channel design is being considered. However, we have no data regarding channel dimensions for this alternative. We understand that EQ guidelines will apply to any selected alternative for this project. This would include all mitigation and/or compensation features into the project plan.

Nonstructural Alternatives

Without project and nonstructural alternatives would have no adverse impacts upon fish and wildlife resources. Therefore, we have no concerns or objections regarding these alternatives, if they are preferred by the Corps or the sponsors.

Holes Creek Channel Improvement Alternatives

Because of existing development and current land use, wildlife habitat associated with the stream corridor is limited in width throughout the project area. However, some areas of dense vegetation, consisting of trees, shrubs, vines, and herbaceous growth extend beyond the immediate stream corridor. These areas are designated as Areas A, (1.50 acre) B, (3.75 acre) C, (0.75 acre) and D (0.75 acre) in the attached copy of an aerial photograph. In addition, we have indicated the approximate width of the improved channel, based upon one-sided construction for 25-year, 50-year, and 100-year channel designs. Channel dimensions were used from Table D-3, Description of Structural Plans, in your draft Section D, Plan Formulation.

It appears that, regardless of channel improvement alternatives used in the stream reach upstream from Springboro Road, most of Areas C and D would be destroyed due to channel construction. Only 0.3 acre of Area D would remain unscathed. In addition about 2 acres of riparian habitat would be lost to one-sided channelization. Two thousand feet of channel realignment would result in the destruction of an additional 0.8 acre of habitat along the stream due to two-sided construction. A housing development along the right bank, (north), would necessitate construction from the left bank, thereby resulting in additional destruction of wildlife habitat. In the 2,000-foot reach downstream from Lamme Road, the right bank has less wildlife value due to current housing construction. Therefore, we would recommend construction along that bank. Vegetation along the left bank is likely to remain because of adjacent land use (nursery).

The section between the Penn Central Railroad and Springboro Road has a large woodlot (Area B) associated with Holes Creek. This woodlot has been undisturbed despite adjacent development, and therefore provides a unique habitat amid a sea of suburbia. Because of the obvious values this area has to wildlife resources, we recommend construction from the right bank along this stream reach. Besides being less disruptive to wildlife habitat, vegetation along the left bank would remain to provide maximum shading of the stream. Right bank construction would also eliminate the need to relocate any houses.

The downstream section between the I-71 ramp and the Penn Central Railroad has less wildlife habitat value. Nevertheless, we recommend construction along the left bank to void disruption of the associated wildlife habitat in Area A.

To compensate for loss of fishery habitat in the project area, we recommend construction of pool-riffle complexes at determined intervals of Holes Creek. In the project area it appears that most of the gradient in Holes Creek exists in the reach from I-71 to approximately 200 feet upstream from the Penn Central Railroad. At that point a "home-made" dam and spillway creates a pool from that point to Springboro Road (approximately 1,000 feet). We believe the downstream gradient could be shifted upstream and used in conjunction with placement of the pool-riffle structures. More recommendations regarding the fishery resources will be forthcoming after our spring survey has been conducted.

Holes Creek Right Bank Levee Alternative

The levee alternative includes construction of a levee from the I-71 ramp to approximately 250 feet beyond the "elbow" of Holes Creek. Channel work would be included for a stream reach of approximately 800 feet upstream from Springboro Road. Habitat losses with this alternative would be significantly less, if the levee is set back from the Holes Creek streambank. Damages in the channel modification area would be similar to the channel improvement alternative, since the proposal requires relocation of the stream reach. However, we understand that this alternative would not include any construction upstream from the proposed channel realignment.

Owl Creek Alternatives

We understand that the original structural alternatives proposed for Owl Creek and its tributary are not economically feasible. We have no concerns regarding viable non-structural alternatives, since they would have no impact upon fish and wildlife resources. As expressed in the Corps' December 20, 1978 letter, a 10-year channel design for Owl Creek from Alexandersville Road to Central Avenue is presently being investigated for economic feasibility. We believe this alternative would not result in significant destruction of resources. Wildlife enhancement features should be implemented for this alternative. Such features would include planting of native trees and shrubs of wildlife value along the channel. If environmental laws were enforced for the paper mill polluter on Owl Creek, consideration could be given to fishery enhancement for the downstream portion of the stream.

Discussion

Our first preference of alternatives for this project would be any of the non-structural alternatives, since there would be no adverse impacts upon the existing fish and wildlife resources. However, it appears that those alternatives, and the levee alternative, are not supported by affected residents and would not provide equitable protection for all residents in the project area. The alternative which would provide equitable protection for all residents is the channel improvement alternative. With this alternative (including channel realignment for 2,000 feet) about 2.8 acres of riparian habitat would be lost. In addition, all of Area C (0.75 acre) and 0.5 acre of Area D would be destroyed. Without the 2000-foot realignment approximately 2 acres of riparian habitat would be lost. However, the impacts to Areas C and D would be the same with the 100-year channel design, whereas the 25-year and 50-year designs would reduce destruction of these areas by only a small fraction.

Losses of riparian habitat and other adjacent blocks with the levee alternative would vary depending on specific alignment of the levee. With the proposed levee alignment and relocated stream reach as shown in Figure 8 of your Public Information Brochure, December 1978, we have estimated a combined loss of approximately 3 acres.

To reduce the destruction of wildlife habitat we recommend a feasible alternative that will be least destructive to fish and wildlife resources. If a channel improvement alternative is selected for the project, we recommend one-sided channel work, as suggested in this report, and other features to comply with EQ guidelines. To prevent secondary impacts to wildlife resources, we recommend placement of Areas A and B and undisturbed portions of Areas C and D under a conservation easement. With selection of levee alternatives, we recommend a conservation easement for Area A and wildlife enhancement features for the oxbow which would be created at the upstream end of the levee and channel construction. In addition, to compensate for losses of riparian habitat, resulting with either alternative, plantings of native trees and shrubs of value to wildlife should be made in disturbed areas throughout the project area. To reduce project costs for wildlife plantings, we suggest the use of a tree spade to relocate trees from disturbed areas to newly constructed areas. Other areas should be seeded with a wildlife mixture if grasses and herbs.

We recommend placement of pool-riffle complexes in the project reach of Holes Creek, but we will address fishery measures in greater detail after our spring fishery survey has been completed.

<u>Summary</u>

A. With selection of the channel improvement alternative, we recommend the following conditions:

   1. Destruction of fish and wildlife habitat should be limited to the absolute minimum necessary for completion of the project.

   2. Erosion control measures should be applied throughout the project construction.

   3. Other features of the EQ guidelines, such as one-sided channel construction should be implemented. Channel construction should be limited to the left bank between the I-75 ramp and the Penn Central Railroad, the right bank between the railroad and Springboro Road, and the right bank upstream from the realigned stream reach.

   4. Undisrupted areas of Areas A, B, C, and D should be placed under a conservation easement.

   5. All disturbed areas within the project area should be reseeded and planted with trees and shrubs of value to wildlife.

B. With selection of the levee alternative, the above recommendations would apply, except that conservation and/or enhancement easement could be limited to Area A and the elbow area of the old stream channel oxbow.

C. Specific recommendations regarding the fishery resources will be included in our July 1 letter of spring fishery survey results.

Sincerely yours,

John Popowski

Area Manager

Enclosures

cc: Chief, ODNR, Div. of Wildlife, Columbus, OH
Regional Director, FWS, Twin Cities, MN (LWR) (SE)
Supervisor, FWS, Columbus Field Office, Columbus, OH


N
SCALE IN FEET
200
0
200
400

MIAMI RIVER BASIN

HOLES CREEK

FISH AND WILDLIFE SERVICE
DESIGNATED POTENTIAL
AREAS

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD-F SEPTEMBER 19[illegible]

CORPS OF ENGINEERS

MATCH LINE A

MATCH LINE B

U. S. ARMY

MIAMI RIVER BASIN

HOLES CREEK

FISH AND WILDLIFE SERVICE
DESIGNATED POTENTIAL
AREAS

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD--F SEPTEMBER 1980

EXHIBIT 13 SHEET 7 OF 7 (2)

MATCH LINE B

MATCH LINE B

U S ARMY

MIAMI RIVER BASIN

HOLES CREEK

FISH AND WILDLIFE SERVICE
DESIGNATED POTENTIAL
AREAS

U S ARMY ENGINEER DISTRICT,
LOUISVILLE KY

ORLPD F SEPTEMBER 1980

EXHIBIT 13 SHEET 7 OF 7 (3)

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

East Lansing Area Office
Manly Miles Building, Room 202
1405 South Harrison Road
East Lansing, Michigan 48823

Colonel Thomas P. Nack
District Engineer
U. S. Army Engineer District
Louisville
Post Office Box 59
Louisville, Kentucky 40201

Dear Colonel Nack:

This is our supplemental letter to our April 20, 1979, draft report on the fish and wildlife aspects of the proposed local flood protection project at West Carrollton, Montgomery County, Ohio. A 1979 spring fishery survey was conducted on the project area of Holes Creek. The following includes the results and recommendations of the survey. These comments have been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and in compliance with the intent of the National Environmental Policy Act of 1969.

Our field biologists conducted fishery surveys of Holes Creek on March 20, May 2, and June 22, 1979 (see Appendix). Electrofishing equipment was used to sample three 1,000-foot stream reaches near Lamme Road, Springboro Road, and Penn Central Railroad. As in our 1978 survey, creek chub and stonerollers comprise the bulk of the fishery biomass and numbers in the project area of Holes Creek. Stonerollers dominate the shallow riffle areas, while creek chubs occupy portions of the stream with low velocity. We collected several 10 inch chubs from the deeper pools (2 feet). Creek chubs appear to be the most common fish caught by young fishermen from the local community.

Other cyprinids collected this spring, but not last year, include carp, common shiner, spotfin shiner, sand shiner, and blacknose dace. Of the sucker family creek chubsucker and hog sucker were found this spring. Hog suckers appear to be well established in the project area of Holes Creek. Blacknose dace and hog sucker are generally indicators of good water quality in streams. Their presence may indicate an improvement of water quality in the lower reaches of Holes Creek.

The centrarchid population in the surveyed reach of Holes Creek appears to be low. We did not succeed in collecting any bass, despite the fact that we found catchable smallmouth bass in Holes Creek upstream from the project area last year. While we did not observe any bass in the project area, we still suspect they may be present, since the entire project reach was not sampled. Small numbers of green sunfish and bluegill were found in Holes Creek downstream and upstream from the Penn Central Railroad.

We counted 15 pool-riffle complexes in Holes Creek from Lamme Road to the I-71 ramp. Pool and riffle sizes vary in length and gradient throughout the affected stream reach. In our recent telephone conversation with Mr. Thomas of your staff, we agreed on a proposal to construct pool-riffle complexes of varying sizes to more adequately simulate a natural condition. We recommend construction of 10 to 15 pool-riffle complexes, depending upon the usable gradient to establish hydrologically stable structures. At least half the riffles should be at least 50 feet long, and half the pools should be at least three feet deep. The remaining complexes can be of variable sizes. Deflectors may also be incorporated at determined intervals to direct flows under cover vegetation along the undisturbed streambank. Eight to 12-inch riprap should be used for the instream structures.

A low-flow channel should be incorporated into the project stream reach. We understand your staff is considering the utilization of natural flow characteristics to establish the low-flow channel. While this concept appears reasonable, we are skeptical that it may not be adequate to cut a channel deep enough to concentrate waters during low-flow conditions. Therefore, we believe a low-flow channel design should be incorporated into the project plans.

During our recent trips to the project site, we noted two Section 208 (of P.L. 92-500) related problems along Holes Creek. One is the construction of drainage ditches to the stream to drain a newly constructed apartment complex along the left bank downstream from Lamme Road. It appears that best management practices are not being utilized to minimize siltation in the stream. The other problem involves the use of an irrigation pump which removes water from the creek for the adjacent nursery activities. Since the demand for irrigation water is highest during dry periods, we anticipate adverse impacts to the fishery resource during low-flow seasons. These concerns should be addressed in the draft EIS.

The opportunity to provide this information is appreciated.

Sincerely yours,

Acting Area Manager

cc: Regional Administrator, U.S. EPA, Federal Activities Br., Chicago, IL
ODNR, Outdoor Recreation Service, Attn: Mike Colvin, Columbus, OH

Appendix

Fish species collected in the summer of 1978 and the spring of 1979 in the proposed project area of Holes Creek, Montgomery County, Ohio.

	1978	1979
Creek chub	X	X
Stoneroller	X	X
Bluntnose minnow	X	X
Carp		X
Common shiner		X
Spotfin shiner		X
Sand shiner		X
Blacknose dace		X
White sucker	X	X
Hog sucker	X*	X
Creek chubsucker		X
Green sunfish	X	X
Bluegill	X	X
Smallmouth bass	X*	
Johnny darter	X	X
Fantail darter	X	X

* upstream from project area

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

IN REPLY REFER TO:
AFA-SE

JAN 1 9 1979

Colonel Thomas P. Nack
District Engineer
U. S. Army Engineer District
Louisville
P. O. Box 59
Louisville, Kentucky 40201

Dear Colonel Nack:

In response to your letter regarding the water resources development study at West Carrollton, Ohio, we offer the following views and comments:

The proposed project area falls within the range of the Indiana bat (Myotis sodalis) and your description of the riparian habitat present indicates it could be valuable summer and nursery habitat for this endangered species. Pursuant to the Endangered Species Act a biological assessment should be conducted to determine the potential impact of the project on the Indiana bat.

We suggest the depth and scope of the survey should be similar to the one conducted by Dr. James B. Cope and associates on the Big Blue River, Indiana, during the summer of 1978. The assessment should include the following components:

1. A survey of bat populations on all streams within the project area with special emphasis placed on the three-mile reach of Holes Creek (which is 80% wooded) and the 1/2 mile along Primrose Tributary and the lower 1/2 mile along Owl Creek. Both of these areas have been described in your Public Information Brochure as being riparian and good song bird and small mammal habitat.

EXHIBIT 15
Sheet 1 of 2

2. Description of the study area including analyses of vegetative community types and their relative densities. Special emphasis should be paid to proposed threatened or endangered plant species which are listed in Ohio (list enclosed).

I would also like to advise you that there may be state listed species within the project area. I suggest you contact the Ohio DNR relative to these species.

Sincerely yours,

W. Ellis Klott

W. Ellis Klott
Acting Regional Director

Enclosures
Plant list and
descriptions

EXHIBIT 15
Sheet 2 of 2

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

IN REPLY REFER TO:
AFA-SE

MAY 11 1979

Colonel Thomas P. Nack
District Engineer
U. S. Army Engineer District
Louisville
P. O. Box 59
Louisville, Kentucky 40201

Dear Colonel Nack:

This will affirm discussions between Messrs. Kessler, Bailey and Johnson on proposed CE projects in Ohio and Indiana. A threshold examination of these projects was conducted March 19-23 1979. A review of pertinent literature was completed and the findings were incorporated into the following biological opinions and recommendations. To reiterate, I will list the projects with minor modifications and comments. If logistical reasons require a delay in completing the biological assessment on any of these projects, the 180-day requirement is mutually waived. However, assessments must be completed before any construction activities can begin, and we would appreciate receiving a list of those projects for which you desire to delay the assessment.

1. Ohio River at Moscow, Ohio - Clermont County. Pursuant to conversations with Dr. David H. Stansbery, malacologist at the Museum of Zoology, Ohio State University, and John Williams, Kentucky Eastern College (who surveyed the area in 1969), the project site is not expected to contain the endangered pink mucket pearly mussel (Lampsilis o. orbiculata). Based on these comments, the contemplated mussel survey at this site is waived, and it is my biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of this species.

   It is also my biological opinion that the project is not likely to jeopardize the continued existence for other listed species. No suitable habitat exists for the Indiana bat or bald eagle and the opportunity for use by migrating Kirtland's warblers and American or Arctic peregrine falcons is remote. Based on currently available data, there are no known proposed species at this site. The project is not within the critical habitat of the Indiana bat and critical habitat for other listed species has not been designated in this area at this time.

2. Holes and Owl Creeks, West Carrolton, Ohio - Montgomery County. Both Holes and Owl Creeks run through moderate to heavily populated areas and the riparian vegetative cover was not conductive

to summer inhabitance by the Indiana bat. The area is not conductive for use by the American and Arctic peregrine falcons or the Kirtland's warbler. Therefore, it is my biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of listed species. The project is not within the critical habitat of the Indiana bat and critical habitat for other listed species has not been designated in this area at this time. Based on currently available data, there are no known proposed species at this site.

3. Dick's Creek, Amanda Station, Ohio - Butler County. This stream contains a moderate amount of industrial and domestic pollution although it still retained pleasing aesthetic qualities. The size and type of riparian vegetative cover is not that normally associated with summer habitat for the Indiana bat and the overstory is incomplete. It is therefore my biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of listed threatened or endangered species. Based on currently available data there are no known proposed species at this site. The area is not within the critical habitat of the Indiana bat and critical habitat for other listed species has not been designated in this area at this time.

4. Clear Creek, Franklin, Ohio - Warren County. Upon examination of vegetative cover and the depth and density of the riparian zone along Clear Creek, it was concluded that the area did not contain the necessary summer habitat for the Indiana bat. Therefore, it is my biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the bat. The area is not within the critical habitat of the Indiana bat and designated critical habitat has not been established for other listed species in this area at this time.

Six species of proposed plants are possible inhabitants of Warren County, Ohio and therefore a biological assessment for the species should be conducted in the project area. The six plants are:

Short's Goldenrod (P)	(*Solidago shortii*)
Price's Grount Nut; (P) Price's Potato Bean	(*Apios priceana*)
Plantain, Heartleaf (P)	(*Plantago cordata*)
Reed Grass (P)	(*Calamagrostis insperata*)
Pinkweed (unnamed) (P) Pennsylvania Smartweed	(*Polygonum pensylvanicum*) (*var. eglandulosum myers*)
American Globeflower (P)	(*Trollius laxus*)

5. Miami River at Carlisle and Chautaugua, Ohio - Warren County. After viewing this project area at numerous locations along the Miami River, it was concluded that due to the lack of suitable habitat, no further investigation of listed species

is necessary. It is my biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of presently listed species. The species considered in this opinion are as follows:

Indiana Bat (E)	(<u>Myotis</u> <u>sodalis</u>)
American Peregrine Falcon (E)	(<u>Falco</u> <u>peregrinus</u> <u>anatum</u>)
Arctic Peregrine Falcon (E)	(<u>Falco</u> <u>peregrinus</u> <u>tundrius</u>)
Kirtland's Warbler (E)	(<u>Dendroica</u> <u>Kirtlandii</u>)

The area is not within the critical habitat of the Indiana bat and critical habitat has not been designated of other listed species in this area at this time. Based on currently available data, there are no known proposed species at this site.

6. <u>Stillwater River, Shiloh, Ohio - Montgomery County</u>. The Stillwater River above the town of Shiloh was viewed and found to contain marginal riparian summer habitat for the Indiana bat. A biological assessment should be conducted once this project area is more specifically defined.

   Other endangered species of concern were the migrant American and Arctic peregrine falcons and the Kirtland's warbler. It is my biological opinion that the flood control project, as presently proposed, is not likely to jeopardize the continued existence of these species. Based on currently available data, there are no known proposed species at this site. The area is not within the critical habitat of the Indiana bat and no critical habitat has been designated for other listed species in this area at this time.

7. <u>Grand Lake, St. Marys and Celina, Ohio - Auglaize and Mercer Counties</u>. This proposed project area includes the shores of Grand Lake and two major drainage streams, namely, the St. Mary's River and Beaver Creek. The shoreline of Lake St. Mary's was found to be well developed with cottages and homes but an occasional wood lot or stretch of undeveloped shoreline contained marginal summer habitat for the Indiana bat. If a specific project site fell within these areas, a biological assessment should be conducted. Similar marginal riparian summer habitat for Indiana bats was also located along the St. Mary's River. Numerous large trees with peeling bark were observed, and generally the overstory and depth of riparian growth met previously observed criteria for this species. Again site specific studies are recommended once project areas and actions become better defined. Beaver Creek contained no observed bat habitat throughout its course to its confluence with the Wabash River in Indiana. It is my biological opinion that any flood control or bank stabilization actions along Beaver Creek is not likely to jeopardize the continued existence of presently listed species. The areas are not within the critical habitat of the Indiana bat and no critical

habitat has been designated for the following listed species at this time:

American Peregrine Falcon (E)	(*Falco peregrinus anatum*)
Arctic Peregrine Falcon (E)	(*Falco peregrinus tundrius*)
Kirtland's Warbler (E)	(*Dendroica kirtlandii*)

One proposed plant, the Plantain, heartleaf (*Plantago cordata*) has been recorded for Auglaize County, Ohio, which is within the area and should be considered during future project planning.

8. Wabash River, Indiana - Adams County. Several sections of the upper reaches of the Wabash River were viewed for potential Indiana bat summer habitat and marginal conditions were found. It is my recommendation that site specific biological assessments be conducted prior to any action taken. The opportunity for use of this section of stream by migrant American and Arctic peregrine falcons and Kirtland's warblers is remote considering their broad migration routes. It is my biological opinion that the project actions, as proposed, are not likely to adversely impact the bird species during their migrations. I recommend a comprehensive biological assessment for the following seven species of listed mussels be conducted in the project area:

Fat Pocketbook Pearly Mussel(E)	(*Potamilus capax*)
Pink Mucket Pearly Mussel (E)	(*Lampsilis orbiculata orbiculata*)
Rough Pigtoe Pearly Mussel (E)	(*Pleurobema plenum*)
Sampson's Pearly Mussel (E)	(*Epioblasma sampsoni*)
Tuberculed-blossom Pearly Mussel (E)	(*Epioblasma torulosa torulosa*)
White Cat's Paw Pearly Mussel (E)	(*Epioblasma sulcata delicata*)
White Warty-back Pearly Mussel (E)	(*Plethobasis cicatricosus*)

Of particular concern is the proposed 300-foot channelization section of the river. If this part of the proposal is adopted, special emphasis should be placed in and below this construction area. The area is not within the critical habitat of the Indiana bat and no critical habitat has been designated for other listed species in this area at this time. Based on data currently available, there are no known proposed species at this site.

9. Vernon Fork of the Muscatatuck River, Indiana - Jackson and Jennings Counties. The logjam removal site on Vernon Fork which borders the Muscatatuck Wildlife Refuge was examined for Indiana and gray bat habitat. Habitat considerations were also given to migrating American and Arctic peregrine falcons and Kirtland's warblers. Bald eagles were discussed with the assistant refuge manager and only one had

been sighted over the refuge during the past two years. In view of this discussion and other considerations previously enumerated, it is my biological opinion that the logjam removal, as proposed, is not likely to jeopardize the continued existence of listed species. Based on currently available data, there are no known proposed species at this site. The area is not within the critical habitat for the Indiana bat and no critical habitat has been designated for other listed species in this area at this time.

10. Brookville Lake, Quakertown State Recreation Area, Indiana. This project proposal consists of constructing a new and expanding an existing parking lot totaling 106 spaces.

    In concurrence with Dr. Andrew Miller's (CE biologist) review, it is my biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of listed species. The area is not within the critical habitat of the Indiana bat and no critical habitat has been designated for other listed species in this area at this time.

11. Monroe Lake, Indiana

    a. Cutright State Recreation Area. This project proposal is for construction of an access road and for parking lot paving.

    b. Paynetown State Recreation Area. This project proposal consists of a sixty-two space parking lot, 48-site campground, comfort station, vault toilet, campground control building, dumping station, paved walks, access road, utilities and shore protection.

    In view of CE biologist Dr. Andrew Miller's conclusions after reviewing the project area, it is my biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the following listed species that may be found within the proposed project sites at Brookville Lake and Monroe Lake, Indiana:

Indiana Bat (E)	(*Myotis sodalis*)
Gray Bat (E)	(*Myotis grisescens*)
American Peregrine Falcon (E)	(*Falco peregrinus anatum*)
Arctic Peregrine Falcon (E)	(*Falco peregrinus tundrius*)
Kirtland's Warbler (E)	(*Dendroica Kirtlandii*)
Bald Eagle (wintering) (E) (Monroe Lake only)	(*Haliaeetus leucocephalus*)

The area is not within the critical habitat for the Indiana bat and no critical habitat has been designated for other listed species in this area at this time.

EXHIBIT 16
Sheet 5 of 6

12. Ohio River at Madison, Indiana. After review of biologist Dr. Andrew Miller's onsite inspection of the caving bank stabilization project at Madison, Indiana, we concur with his evaluation and offer the following biological opinion. The project action, as proposed, is not likely to jeopardize the continued existence of the following listed species:

Indiana Bat (E)	(Myotis sodalis)
Gray Bat (E)	(Myotis grisescens)
American Peregrine Falcon (E)	(Falco peregrinus anatum)
Arctic Peregrine Falcon (E)	(Falco peregrinus tundrius)
Kirtland's Warbler (E)	(Dendroica Kirtlandii)
Pink Mucket Pearly Mussel (E)	(Lampsilis orbiculata orbiculata)

The area is not within the critical habitat for the Indiana bat and critical habitat has not been designated for other listed species at this site at this time.

If further information is needed regarding these biological opinions or recommended biological assessments, please contact this office a 612-725-3596.

Sincerely yours,

Charles A. Hughlett

Charles A. Hughlett
Acting Regional Director

EXHIBIT 16
Sheet 6 of 6

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111

IN REPLY REFER TO:

AUG 8 1980

Colonel Thomas P. Nack
District Engineer
U. S. Army Engineer District
Louisville
Post Office Box 59
Louisville, Kentucky 40201

Dear Colonel Nack:

This is our final Fish and Wildlife Coordination Act report for the proposed local flood protection project at West Carrollton, Montgomery County, Ohio. This report is based primarily on your May 1980 draft main report and draft environmental impact statement and has been prepared under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and in compliance with the intent of the National Environmental Policy Act of 1969.

Since our draft report of April 30, 1979, you have investigated four alternatives, Plans A through D in your May 1980 draft main report. Plan A includes flood proofing 272 homes to the 100-year flood level and preservation of 24 acres of land along Holes Creék. Plan B includes 3,480 feet of earth levee, 860 feet of concrete wall, one pumping plant, and 1,500 feet of realignment of Holes Creek. This plan would provide Standard Project Flood level of protection for developments on the right bank of Holes Creek. Plan C consists of 5,700 feet of channel enlargement and replacement of the Penn Central Railroad bridge, thus protecting the community from 25-year flood levels. Plan D includes 6,550 feet of channel enlargement, replacement of the Penn Central Railroad bridge, and modification of the Springboro Pike bridge, resulting in 500-year flood protection.

Plan D is the tentatively selected plan. The 6,550 feet of "improved channel" consists of three segments:

1. The segment from Lamme Road to Springboro Pike includes widening on the left side only, resulting in a 6H-1V side slope on the left bank and a bottom width varying from 75 feet to 165 feet. Channel realignment will result in two new channel portions which would isolate two oxbows. Riprap would be used at channel curves and at bridge approaches.

2. The next segment extends for 210 feet under and downstream of the Springboro Pike bridge and would consist of a rectangular concrete channel with a bottom width of 120 feet.

3. The last segment extends from the concrete channel downstream to the end of the project. This channel segment would be widened from 100 to 200 feet at the bottom and would have 3H-1V side slopes. Also, the railroad bridge would be replaced with a larger structure.

Fish and wildlife mitigation measures developed for Plan D include a low-flow channel (30 feet wide and 1 foot deep) with pool-riffle structures throughout the modified channel and acquisition of a 5-acre woodlot along the left bank downstream from Springboro Pike.

Based upon the 500-year channel design shown on Plate 2, Sections 1 through 3 of the main report, it appears that the impacts of the selected plan would have greater adverse impacts upon fish and wildlife resources than we had anticipated in our April 30, 1979 draft report. Using your design of the modified channel on Plate 2, we have conservatively estimated a loss of approximately 9.6 acres of high quality riparian habitat along Holes Creek. The largest area lost would be approximately 2.8 acres of the woodlot and stream corridor along the left bank downstream from Springboro Pike. Plan D includes a very wide channel which results in destruction of a significant portion of the woodlot through this project reach. The alignment is a worse condition with respect to minimizing environmental damages. We understand this alignment was selected to avoid removal of a portion of a parking lot which was recently placed immediately adjacent to the right streambank. Thus, an equal or greater portion of woodlot would be sacrificed for a portion of a parking lot. Your proposal for the modified channel upstream from Springboro Pike is also greatly enlarged, resulting in added destruction of wildlife habitat. More riparian vegetation would be lost with your proposal to construct along the left bank than the right bank; however, the difference is not significant.

We are pleased that you incorporated the 4- to 5-acre woodlot along Holes Creek as a mitigation measure for this project. To provide further mitigation for the loss of 9.6 acres of riparian habitat, we recommend that two oxbow areas (1.0 and 1.2 acre) upstream from Springboro Pike and one oxbow (0.8 acre) upstream from the Penn Central Railroad also be placed under a wildlife conservation easement for the life of the project. The feasibility of managing at least one oxbow for aquatic resources should be pursued. If a less damaging alignment of the stream reach from the Penn Central Railroad to Springboro Pike cannot be designed, the 1.2-acre triangular plot between the Dixie Highway and Penn Central Railroad should also be included as a wildlife conservation easement. The protection of this plot, the three oxbow areas and the 5-acre woodlot would satisfactorily mitigate the acreage loss of riparian habitat in the project area.

Disturbed areas should be planted with trees and shrubs of value to wildlife. Many species of particular value to wildlife are available for incorporation into the proposed plan. The following list includes some suggested species:

TALL TREES	TALL SHRUBS
White pine	Red cedar
Colorado spruce	Crabapple
Sugar maple	Hawthorn
White oak	Cherry
Red oak	Autumn olive
Beech	Elderberry
Birch	Sumac

LOW SHRUBS	ANNUALS
Blackberry	Sunflowers
Honeysuckle	Asters
Snowberry	Daisies
Trumpet creeper	Black-eyed Susan

A diverse group of the above species, or others of value to wildlife, should be planted in a mosaic pattern; that is, plantings of each species should be planted in small groups among groups of other species. This method would provide necessary food and cover for wildlife and would be aesthetically pleasing to residents of the area.

Your draft report indicates that the low-flow channel would be 30 feet wide and 1-foot deep. In most portions of the stream 30 feet is wider than the existing stream during normal flows. Since the purpose of the low-flow channel is to concentrate the flow during periods of low flow, we suggest that the low-flow channel be limited to less than 10 feet in width. Our recommendation for the number and size of pool-riffle complexes throughout the project reach remains the same as expressed in our July 18, 1979 supplemental letter to our draft report. Pool-riffle complexes can be spaced at regular intervals or as determined by gradient. Specifically, pools or backwater areas (with low current velocity) resulting from placement of deflectors should be placed under the Dixie Highway, Penn Central Railroad and Springboro Pike bridges to take advantage of shading provided by these structures. For the relocated channel reaches we recommend that clean gravel substrate be removed from the oxbows and placed in the new channel, if adequate gravel is not already present in the new channel.

Summary of Recommendations

In addition to your proposed fish and wildlife compensation measures, we recommend the following:

1. One oxbow area upstream from the Penn Central Railroad and two oxbow areas upstream from Springboro Pike should be placed under a wildlife conservation easement.

2. The feasibility of managing at least one oxbow (preferably the upstream oxbow) for aquatic resources should be pursued.

3. If a less destructive alignment for the channel reach between the Penn Central Railroad and Springboro Pike cannot be incorporated into the Plan, the triangular plot between Dixie Highway and Penn Central Railroad should also be included as a wildlife conservation easement.

4. All disturbed areas should be reseeded and planted with trees and shrubs of value to wildlife.

5. The low-flow channel should be limited in width to less than ten feet.

6. In addition to our recommendation for pool-riffle structures in our July 19, 1979 letter, one pool forming structure should be placed under each of the three bridges within the project reach.

7. Clean gravel should be placed in the new channel to improve the substrate.

8. The project should be designed to allow uninhibited movement of fish species through the project area.

We would appreciate notification of any major alterations in project plans in order that related revisions may be made in our report.

Sincerely yours,

Charles A. Hughlett

Charles A. Hughlett
Acting Regional Director

EXHIBIT 17
Sheet 4 of 4

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Division of Ecological Services
Columbus Field Office
3990 East Broad Street
Columbus, Ohio 43215

IN REPLY REFER TO:

August 29, 1980

Colonel Thomas P. Nack
District Engineer
U. S. Army Engineer District
Louisville
Post Office Box 59
Louisville, Kentucky 40201

Dear Colonel Nack:

This responds to Mr. Jenkins' August 11, 1980, letter requesting our comments on proposals to extend channel improvement measures upstream from Lamme Road on Holes Creek, West Carrollton Local Flood Protection Project, Montgomery County, Ohio. This letter should be considered an addendum to our August 8, 1980, Final Fish and Wildlife Coordination Act Report. We understand this letter and our final report will be included in the final EIS.

Recent conversations with your staff revealed that several proposals were considered for this 1000-foot reach of Holes Creek. At this time, however, the number of proposals have been reduced to the one included in your August 11 letter. The 1000-foot channel improvement extension would consist of widening the channel bottom to 100 feet, with 3:1 riprap slopes for the right streambank and the use of stepped gabions along the left bank. The upstream 0.1 mile reach would not be widened, but riprap would be placed on both natural sloping streambanks. The "low flow" dam near the Lamme Road bridge would be removed and a new one would be constructed near the upstream end of the project.

The 1000-foot reach of Holes Creek upstream from Lamme Road is similar to the downstream portion. The substrate consists primarily of gravel and sand. Small trees and shrubs cover most sections of the streambanks. Immediately downstream from the dam, deep plunge pools have developed which harbor bass, sunfish, and minnows. Upstream from the dam the water is shallow, since sediment has filled the pool created by the dam.

In general, we recommend the same features we included in our August 8, 1980, final report. That is, a low flow channel should be incorporated in the widened stream reach. One-sided channel construction should be used where possible concentrating on the right bank to maintain shading benefits from trees along the left bank. Also, we prefer leaving vegetation (in particular, stump and root systems) to stabilize banks in lieu of the placement of riprap. We support your plan to replace the low flood dam, although it should be designed to allow upstream movement of fishes through the reach. A notched

design may provide this feature, as well as cause the creation of plunge pools similar to the existing ones. We can suggest specific features for this structure prior to, or at the initiation of the construction phase.

We appreciate this opportunity to provide these comments.

Sincerely yours,

Kent E. Kroonemeyer

Kent E. Kroonemeyer
Supervisor

cc: ODNR, Outdoor Recreation Services, Attn: Mike Colvin, Columbus, OH
Chief, Ohio Division of Wildlife, Columbus, OH

ODNR

Ohio Department of Natural Resources

Fountain Square • Columbus, Ohio 43224

September 5, 1980

Colonel Charles E. Eastburn, District Engineer
U. S. Army Engineer District, Louisville
600 Federal Place - P. O. Box 59
Louisville, Kentucky 40201

Dear Colonel Eastburn:

Reference is made to your correspondence regarding the proposed flood control project on lower Holes Creek in the vicinity of West Carrollton.

We wish to offer our concurrence in your recommended plans of improvement. In addition, we would direct your attention to our comments on the draft environmental impact statement, particularly those comments relating to mitigation.

With regard to the President's proposed cost sharing policies, we wish to acknowledge that such policies have not been accepted by the Congress and enacted into law. Therefore, we feel it appropriate for planning purposes to identify and adhere to cost sharing arrangements which are currently applicable.

Sincerely,

Robert W. Teater

ROBERT W. TEATER
Director

RWT:gfp

cc: Miami Conservancy District

EXHIBIT 19

Section C

Comments and Responses

Section C
Comments and Responses

On 9, 10 and 11 June 1980, drafts of the main report, including the DEIS, were sent to affected Federal and non-Federal agencies, local organizations and governments, and to individuals and groups that had expressed an interest in the study. The draft Appendices were furnished to agencies and Government entities for review. This initial mailing consisted of 199 copies of the draft report with the DEIS and 42 copies of the Appendices. Also, a notice of availability of the draft report and EIS were sent to all concerned interests. This resulted in approximately 225 additional copies of the draft main report and DEIS being sent for review. All letters received as a result of the review of the documents are listed and displayed in this section. Corps of Engineers responses to comments contained in the review letters are appropriately displayed.

United States Department of Agriculture

Soil Conservation Service

P.O. Box 2890
Washington, D.C.
20013

JUN 20 1980

Colonel Thomas P. Nack
Louisville District Corps of Engineers
P.O. Box 59
U.S. Department of the Army
Louisville, Kentucky 40201

Dear Colonel Nack:

This is in response to your letter of June 9, 1980, transmitting your Draft Survey Report and Draft Environmental Impact Statement (EIS) for flood control improvement at West Carrollton, Ohio.

Any Soil Conservation Service (SCS) comments on this report and the EIS will be provided to you by the SCS State Conservationist, Mr. Robert R. Shaw, Federal Building, Room 522, 200 North High Street, Columbus, Ohio 43215. You will not receive comments directly from this office.

Comment noted

We appreciate the opportunity to review this report.

Sincerely,

J.W. Haas

JOSEPH W. HAAS
Deputy Chief for
Natural Resource Projects

United States Department of Agriculture

Soil Conservation Service

200 North High Street
Room 522
Columbus, Ohio 43215

July 10, 1980

Colonel Thomas P. Nack
U.S. Department of the Army
Louisville District Corps of Engineers
P.O. Box 59
Louisville, Kentucky 40201

Dear Colonel Nack:

The Draft Survey Report and Draft Environmental Impact Statement for flood control improvements along Holes Creek at West Carrollton, Ohio, was forwarded to the US Soil Conservation Service, State Conservationist, Columbus, Ohio, for review and comment.

We have reviewed the drafts and our comments are as follows:

Soils are discussed on page 62, section 4.02. The Fox-Ockley Soil Association soils mentioned in the second sentence are terrace soils, not flood plain. However, some terrace soils are occasionally flooded.	The FEIS has been revised accordingly.
A detailed soil survey report is available for Montgomery County. S-il Map Sheet No. 62 of this report shows much of the const--tion area to be in the Ross Silt Loam and Ross-Urban Land Complex soils. Table 6 of the survey under Dikes, Levies or Embankments describes these soils as "Fair stability and compaction, moderate permeability, low compressibility, and the possibility of piping exists.	Comment noted.
Our important farmland maps show there is prime farmland in the project area. The 13 acres of nursery land that are to be used as borrow are classified prime farmland. Other project areas are not now classified prime farmland, due to updated definitions, although some small areas may be so indicated on our maps.	The FEIS has been revised to reflect the prime farmland classification However, no borrow will be required for the selected plan.
On page 66 erosion during construction is discussed. This can be significantly reduced by the use of temporary seedings, mulching, etc.	Comment noted. Concur.
Upon completion of the project all exposed areas, including the borrow, should be permanently vegetated.	

We appreciate the opportunity to review and comment on this project.

Sincerely,

Robert R. Shaw
State Conservationist

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHEASTERN AREA STATE AND PRIVATE FORESTRY
370 REED ROAD — BROOMALL, PA. 19008
Telephone (215) 461-3170

1950
July 24, 1980

Thomas P. Nack, Colonel
Department of the Army
Louisville District Corps of Engineers
P. O. Box 59
Louisville, KY 40201

Refer To: ORLPD-F, Draft
Environmental Impact Statement,
Flood Control
West Carrollton, OH

Dear Colonel Nack:

Plan A, flood proofing, combined with gradual conversion of the flood plain from flood-prone structures to flood-compatible uses, would preserve stream-side vegetation and probably be the most economical plan over a long enough period of time.

Comments noted.

Although trees and shrubs cannot be planted directly on the proposed levees and rip rapped areas under the 500 year plan, perhaps some could be planted as closely as possible to mitigate the severe aesthetic impact of the construction areas.

Graded side slopes of the new channel could be mulched with wood chips, straw, etc. if these slopes are exposed in the winter, or dry periods in midsummer, when establishment of grass or legume cover is difficult or impossible.

We believe that oxbow lakes remaining from the old channel should where possible be retained with a connection to the new channel, as fish and wildlife habitat.

Because of the relatively small size of the cutoff channels, it was decided that they would be filled and converted to terrestrial habitat or utilized for recreation facilities. The possibility of retaining the cutoff channels could be considered in later stage planning and design.

Thank you for the opportunity to review this statement.

Sincerely,

for WILLIAM G. HERBOLSHEIMER
Acting Assistant Area Director
Resource Protection

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Productivity,
Technology and Innovation
Washington, D.C. 20230
(202) 377-xxxx 4335

July 24, 1980

Colonel Thomas P. Nack
U.S. Army Engineer District, Louisville
P. O. Box 59
Louisville, Kentucky 40201

Dear Colonel Nack:

This is in reference to your environmental impact statement entitled "West Carrollton, Ohio." The enclosed comments from the National Oceanic and Atmospheric Administration are forwarded for your consideration.

Comments noted.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving eight (8) copies of the final environmental impact statement.

Sincerely,

Bruce R. Barrett

Bruce R. Barrett
Acting Director, Office of
Environmental Affairs

Enclosure   Memos from: Mr. Robert B. Rollins
National Ocean Survey
NOAA

Mr. Richard E. Hallgren
National Weather Service
NOAA

UNITED STATES DEPA...MENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SURVEY
Rockville Md 20852

JUL 14 1980 OA/C52x6:JLR

TO: PP/EC - Joyce M. Wood

FROM: for OA/C5 - Robert B. Rollins James O'Neil

SUBJECT: DEIS #8006.16 - West Carrollton, Ohio

The subject statement has been reviewed within the areas of the National Ocean Survey's (NOS) responsibility and expertise, and in terms of the impact of the proposed action on NOS activities and projects.

Geodetic control survey monuments may be located in the proposed project area. If there is any planned activity which will disturb or destroy these monuments, NOS requires not less than 90 days' notification in advance of such activity in order to plan for their relocation. NOS recommends that funding for this project includes the cost of any relocation required for NOS monuments.

Measures will be taken to provide for relocation of any such survey monuments which may be affected.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
Silver Spring Md 20910

Rec'd PP/EC JUL 17 1980

Date JUL 1 5 1980 Reply to Attn of W2:AFF

To PP/EC - Joyce Wood

From OA/W - Richard E. Hallgren

Subject DEIS 8006.16 West Carrollton, Ohio

REF: Draft DEIS of May 1980 with your memo of 6/19/80

We have reviewed the report and noted on page 13 that "Investigations indicate that the major water resource problem is confined to flood damages." However, the Impact Assessment Summary (table 7) and the text make no reference to flood warning systems as a nonstructural alternative or companion item to other approaches.

It is considered an oversight not to include references to the availability of the flood warning services provided by the National Weather Service out of its River Forecast Center in Cincinnati and its Weather Service Forecast Office in Cleveland. These services are described in the enclosure.

Thank you for the opportunity of commenting on the DEIS.

Enclosures

Flood forecasting and flood warning systems are discussed on pages B-6 and B-8 of the appendices to the Main Report.

National Weather Service

Flash Flood Program

In many communities the interval between heavy rainfall and flooding is too short for forecast preparation by the River Forecast Center (RFC). This generated the need for the present Flash Flood Program.

Three alternate methods are used to prevent loss of life and alleviate property damage in flash flood situation. These are: 1) self-help forecast procedures, 2) Flash Flood Alarm Systems (FFAS), and 3) generalized flash flood watches and warnings. Selection of a method for a specific community depends on the hydrologic nature of the problem in that area. In some cases a combination of methods is used.

With the first method, a forecast procedure prepared by NWS officials is provided to a community official. He collects rainfall data and prepares the official forecasts required.

The FFAS is a specialized river gage which senses a pre-selected critical water level and sounds an alarm. The alarm portion of FFAS's is placed in some disaster-oriented office, such as a police station which is always manned around the clock. Disaster officials warn endangered citizens and monitor upstream conditions to get an idea of the stage to be expected.

Areas which cannot be served by either of these methods must rely on flash flood watches and warnings. The watch means that conditions conducive to flooding are expected. Interested parties should stay informed and ready for immediate action if a warning is received or flooding is observed. The warning means that flooding is imminent or in progress and low areas should be evacuated immediately.

The success of any natural disaster warning program is dependent on community preparedness and pre-designed plans of action.

National Weather Service

Flood Warning Program

The National Oceanic and Atmospheric Administration (NOAA) National Weather Service provides flood forecasting service for major river basins. This system involves predictions of anticipated stages at a particular gage or gages in the basin. These forecasts are based on observed precipitation and stages at upstream points and anticipated weather conditions. The flood forecast is transmitted to city officials, newspapers, and radio and television stations in the basin. These media disseminate the information to residents of the flood plain in the form of a flood warning. This timely forewarning permits protective measures to be undertaken by industrial plants, public utilities, municipal officials, and individuals with property in the lowlands. Services available are of the following types:

1. Flash Flood: The responsible Weather Service Forecast Office (WSFO) supplies weather forecasts twice daily for the State. In addition to the routine forecasts, special forecasts of severe storms and general flash flood watches for small streams are issued as required. WSR-57 Weather Radar installations have capability for immediate detection and evaluation of rainfall intensity, location, and storm movement. Information is promptly relayed by teletype circuits and telephone to news media and community officials and law enforcement agencies. The Weather Service Office (WSO) issues Flash Flood Warnings as required for small streams in its area of responsibility.

2. Major Floods: River stage forecasts are based on radar coverage, reports from river and rainfall reporting stations and telemetry in or near the basin. The River Forecast Centers (RFC) are staffed with professional hydrologists responsible for the preparation of river forecasts based on water equivalent of snow cover, rainfall-runoff relations, streamflow routing, and a working knowledge of anticipated weather conditions. The lead time between distribution of the forecasts and the flood crest may be short; however, lead time normally ranges from 12 hours for rainfall and up to several weeks for snowmelt. Specific crest forecasts are issued as required. WSFO's and WSO's with Hydrologic Service Area responsibility provide the interpretation and distribution of flood forecasts and the operation of the hydrologic reporting substation network in its area.

3. Hydroclimatic Data: Most of the data from the network is published. These records provide the basis for forecasts as well as for the planning and design of protective works and their operation during floods. River and flood forecasting is fundamental in the design and essential in the operation of a levee or reservoir system.

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
175 WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

August 6, 1980

Colonel Thomas P. Nack
District Engineer
U.S. Army Engineer District, Louisville
P.O. Box 59
Louisville, KY 40201

Dear Colonel Nack:

The Department of the Interior has reviewed the draft environmental statement and draft survey report (combined) for water resources development at West Carrollton, Miami River Basin, Montgomery County, Ohio. Our review comments follow:

DRAFT MAIN REPORT

General Comments

In general, we believe the draft Main Report is adequate in its description of the alternative and selected plans and its discussion of the associated impacts of each plan. However, based on information in the Report, the Fish and Wildlife Service is currently preparing its final Fish and Wildlife Coordination Act report. They will be updating recommendations made for the channel improvement alternatives in an earlier report.

Specific Comments

Page 2, Scope of Study:

We believe "fishery resources" is pertinent as one of the other water resource users and should be included in subsequent documents.

Page 6, paragraph 3:

If all fish species are not included here, reference should be made to a complete list which should be included in the document.

Page 24, Table 2:

This table indicates [illegible] significant difference between a 100-year plan and a 500-year plan. If a 100-year plan would significantly reduce damages to fish and wildlife resources, we believe this plan should be addressed further. What would be the channel size for the 100-year plan?

The Scope of Study section identifies major water resource problems and uses in the basin that may be affected by water resource development. Fishery resources are not considered to be a major water resource use or problem and, therefore, are not discussed in this particular section.

This list is felt to adequately describe the fish life in the stream; however, the list in paragraph 4.10 has been expanded to include all fish collected in 1978 and 1979 surveys by the U.S. Fish and Wildlife Service.

Since the two plans are very similar, the fish and wildlife impacts are also very similar. The 500-year plan was selected over the other channel improvement plans because it reduces damages and adverse impacts on life, safety and well-being of residents in the flood plain.

Page 39, Table 7:

Columns for Plans C and D appear to be in error with respect to riparian vegetation. We suspect Plan C would result in eliminating 16 percent of wooded streambanks and Plan D would eliminate 29 percent.

DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS)

General Comments

The environmental statement would be strengthened by including information on either beneficial or adverse effects of channel improvement on downstream flooding (page 66, paragraph 5.04).

If there is a possibility that some of the materials excavated during the proposed channel improvements might be polluted, the potential for impacts on groundwater from disposal in gravel pits or upland locations should be assessed.

The Bureau of Mines' Eastern Field Operations Center has reviewed the subject report. Sand and gravel are the only mineral resources which could be affected by the proposed levee or channel improvement plans. Considering the nature of the project, existing land use, and the relatively small area involved, effects should be minimal; therefore, the Bureau of Mines has no objection to the project or the environmental statement and draft Survey Report. For completeness, the statement should include quantity and value of materials to be used in flood control structures.

We encountered difficulty in evaluating the alternatives by the comparative analysis in Table 7, as the value of the factors seems to vary from plan to plan. For example, it is stated that 305 residential properties are situated in the 100-year floodplain and that 272, or about 90 percent, would be protected with implementation of Plan A.

The number of homes protected to the 100-year level are not stated for Plans B, C, and D. Plan D, which is preferred, appears to protect only 28 more homes, for a total of approximately 94 percent, than Plan A, at what we presume to be the 500-year floodplain. Plan A appears to be significantly more environmentally sound than Plan D and, in addition, Plan D costs substantially more than Plan A and has a less favorable cost/benefit ratio.

We note that Executive Order 11988, while mandating reduction of flood loss and minimization of impact on human safety, health, and welfare, also charges agencies with the restoration and preservation of the natural and beneficial values served by the floodplains.

In view of this, it is questionable that an environmental basis is laid in the draft environmental statement for the selection of Plan D, and we urge that the final environmental statement reflects clarification of the issues raised in the foregoing.

The information shown was correct at the time. The smaller impact of the larger channel is due to the one side only construction for about 3,800 feet. However, the extension of the selected plan has increased the elimination of streambank vegetation to about 30 percent. About the same percentage applies to the 25-year plan.

The channel improvement project would not have a significant effect on Miami River flooding conditions.

It is not anticipated that excavated materials would cause pollution problems from disposal.

Appendix E (tables E-2 through E-5) lists quantities and values of materials to be used in structures.

It is true that underlying differences may not be expressed in a comparison based upon a particular evaluation factor. Not all the residential properties would be protected by Plan A because not all are suitable candidates for flood proofing. Also, this comparison reflects only homes within the 100-year flood plain. The 500-year plan would actually protect additional homes between the limits of the 100-year and the 500-year flood plain.

The environmental statement indicates that the flood proofing alternative is preferred from an environmental standpoint, but it lacks the support of local interests. Table 9, part D, of the Main Report gives a ranking of the plans based upon various comparison factors.

In general, we believe the draft EIS is adequate in its description of fish and wildlife resources and the project's impacts upon those resources. Some recommendations from previous Fish and Wildlife Service letters have already been incorporated into the project design. We commend your staff for their cooperation and effort in making design modifications per earlier recommendations. We believe it would be helpful to us, and the public in reviewing the document, if you responded to recommendations in the appendices of the EIS.	Response is included in the Main Report in the discussion of the 500-year plan under Views of Federal Agencies.
At several locations in the draft EIS, it is stated that opportunities for commercial and residential development would be enhanced as a result of this project. Our understanding is that this type of project is to protect existing development in the floodplain, not enhance future development. Furthermore, enhancement of development in the floodplain is not in compliance with Executive Order 11988 on Floodplain Management. With continued floodplain development these fish and wildlife resources will continue to be destroyed, and flood damages will continue to escalate, in spite of this type of channel improvement project.	The project would not significantly enhance the conversion of undeveloped land to developed land since the affected flood plain is already nearly completely developed. Investigations have shown that open areas along Holes Creek are likely to be converted to residential and commercial use by 1985 regardless of whether the flood control project is constructed.
We noted that problems discussed in a U.S. Fish and Wildlife Service early coordination letter dated July 18, 1979, regarding excessive siltation into the stream from adjacent construction and removal of irrigation water from the stream during the dry season were not included in the draft EIS. These items should be discussed in the final EIS.	The Corps of Engineers has no control over such activities and cannot predict whether or not they will occur in the future.
<u>Specific Comments</u>	
Page 53, paragraph 1.021:	
"Some vegetation" should read "all vegetation."	We concur that all vegetation would be lost within those areas cleared for construction.
Page 53, paragraph 1.03d:	
Since riparian vegetation is a natural value of the floodplain, we believe the proposed action would have a <u>major</u> effect.	The effect on riparian vegetation would be major, but the overall effect upon natural values of the flood plain would be minor because of the existing highly developed character of the area.
Page 62, paragraph 4.05:	
We believe this paragraph is incorrect with respect to water quality of Holes Creek. Perhaps the reference to "high bacteria and solids levels" refers to the downstream portion of Owl Creek which is adversely affected by a paper plant discharge. We do not have data on bacteria counts; however, all of our observations indicate low levels of suspended solids.	We concur that the impression given is incorrect. The FEIS has been revised.
Page 63, paragraph 4.07:	
This paragraph states that the riparian community is more susceptible to alteration than the woodlot community. We believe both communities are susceptible to alteration. The woodlot community is susceptible to alteration due to continued residential development in the floodplain. The vegetative community along the creek is susceptible to alteration due to this project.	The FEIS has been revised.

Page 63, paragraph 4.10: Pondweed, arrowhead, bulrush, and cattail are not in the project reach of Holes Creek. However, if you are including the entire creek, smallmouth bass should be included in the discussion on the stream fishery.	Concur. FEIS revised accordingly.
Page 68, paragraph 5.13: Disturbed areas should be seeded with a wildlife meadow mixture. The Fish and Wildlife Service can provide technical assistance regarding seeding mixtures which are recommended for their wildlife value and erosion control values. We recommend plantings of native plant species in appropriate locations throughout the project area.	Comment noted.

Sincerely yours,

S. D. Minor

Sheila D. Minor
Regional Environmental Officer

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION 5
18209 Dixie Highway
Homewood, Illinois 60430

July 21, 1980

IN REPLY REFER TO
HED-05

U.S. Army Engineer District, Louisville
Attn: Plan Formulation Branch
P. O. Box 59
Louisville, Kentucky 40201

Dear Sirs:

The draft environmental statement for the flood control improvements at West Carrollton, Ohio has been reviewed. The proposal will not adversely affect the Federal-aid highway system and, therefore, we have no comments to offer on the draft.

Sincerely yours,

Donald E. Trull
Regional Administrator

By: W. G. Emrich
W. G. Emrich, Director
Office of Environment & Design

Comment noted.

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST
CHICAGO ILLINOIS 60604

REPLY TO ATTENTION OF

14 AUG 1980

Colonel Thomas P. Nack
District Engineer
U.S. Army Engineer District, Louisville
P.O. Box 59
Louisville, Kentucky 40201

RE: 80-025-155
D-COE-F36067-OH

Dear Colonel Nack:

We have completed our review of the Draft Survey Report and the Environmental Impact Statement (EIS) for flood control at West Carrollton, Ohio dated May 1980. The proposed plan consists of four alternatives to relieve flood problems along Holes Creek in West Carrollton, Ohio. These are flood proofing, a levee on the right bank of Holes Creek, and two channel improvement plans providing 25-year and 500-year frequency of occurrence flood protection. We find the Draft EIS to be inadequate in its evaluation of aquatic life resources and impacts; secondary project impacts resulting from enhanced development opportunities, use of borrow areas, and relocation of water and sewer lines; and consideration of the non-structural alternative.

We have classified the Draft EIS as Category 3. Specifically, this means that the Draft EIS does not adequately assess the environmental impacts of the proposed project. The document contains insufficient information to permit a reasonable review of project features considered in the EIS, including failure to provide information to permit an evaluation of primary effects or significant secondary effects. The document fails to adequately consider project features which we believe will have a significant impact on the environment. This is based on the level of information provided relative to the three structural project alternatives. The classification and date of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on proposed Federal actions under Section 309 of the Clean Air Act.

The attached comments provide details of our review findings. If you have any questions regarding our categorization procedures or comments, please contact Rick Pitorak of my staff at 312/886-6689 or the above address. We look forward to meeting with members of your staff to resolve our concerns.

Sincerely yours,

John McGuire
Regional Administrator

Attachment

Comments by the U.S. Environmental Protection Agency on the Draft Environmental Impact Statement for Flood Control at West Carrollton, Ohio

STRUCTURAL ALTERNATIVES

Executive Order 11988 on Floodplain Management directs Federal agencies to "avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative." It must be demonstrated, then, that no practicable alternative exists if development opportunities are stimulated.

The EIS summarizes compliance with Executive Order 11988. The project will not significantly affect flood plain development because very little undeveloped land remains. The EIS also outlines measures to minimize impacts to the existing natural values of the flood plain.

In addition, the Executive Order requires each Federal agency to "provide leadership and...take action...to restore and preserve the natural and beneficial values served by floodplains" while reducing flood losses. The EIS should be specific in addressing compliance with the Executive Order for the structural alternatives being considered.

The three structural methods of flood control along Holes Creek all have the potential for significant environmental impacts which are not documented adequately in the Draft EIS. Our specific comments in that regard follow:

Aquatic Life

The assessment of benthic fauna for Holes Creek, (page 6, paragraph 3 of the Draft Survey Report and page 63, paragraph 4.10 of the Draft EIS) is inadequate. A complete assessment of benthic fauna should include the identification and enumeration of aquatic organisms to the lowest taxon possible. Sampling should be performed during each season for a one-year period. The Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA) state in §1502.22(a), "If the information relevant to adverse impacts is essential and is not known and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement." As two of the proposed project alternatives call for significant channel modifications, adequate characterization of stream benthos is essential to understanding potential environmental impacts. The relative importance of the stream as a fishery or for other uses in this area of Ohio should also be established.

Additional information on macroinvertebrates for sampling sites in Holes Creek upstream of the project area has been referenced in the Final EIS. The information referenced is considered to be adequate to characterize the benthic fauna of Holes Creek. Additional information on the sport fishery has been added to the Final EIS.

Secondary Impacts

Potential secondary impacts of project implementation should be addressed in detail in the Final EIS. The CEQ's Regulations state in their instructions for addressing environmental consequences of an action (§1508.8(b)), that "Effects" include: "Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other changes in the pattern of land use..." Project impacts resulting from enhanced development opportunities, use of borrow areas, and relocation of water and sewer lines should all be addressed.

The open land in the project area is projected to undergo commercial and residential development with or without the project. The character of currently developed land may change, but there is very little undeveloped land occurring in the project area.

Assessments of project alternatives that may stimulate development opportunities should thoroughly address the environmental impacts of such development. Paragraph 5.26 on page 70 of the Draft EIS states that enhanced development

opportunities will exist due to a reduction of flood hazards. Compliance with Executive Order 11988 on Floodplain Management must be demonstrated.

Potential environmental impacts resulting from the use of borrow areas necessary for levee construction should be fully addressed in the Final EIS. Paragraph 5.01 on page 66 and paragraph 5.23 on page 69 refer to 13 acres of land needed for excavation of levee borrow material. The nature of this land should be carefully defined, and plans for stabilization of these areas both during and post-construction should be detailed.

Additional impacts of project alternatives may result from relocation of sewerlines, powerlines, and water mains that parallel or cross Holes Creek. This is pointed out in paragraph 5.31 on page 70 of the Draft EIS. Associated impacts of any utility relocations, such as induced development and construction impacts, should be identified and explained thoroughly.

Project alternatives that encourage development, require borrow areas, or require public utility relocation, all require use of the soil resource base. In order to ensure protection of this resource, soil information is necessary to facilitate a clear understanding of project impacts. Soil maps, soil descriptions, and various soil characteristics important to the interpretation of the soils in question for a variety of potential land uses, should be included. The attached sheet gives a list of the soil information which will normally allow an assessment of potential environmental impacts resulting from major land disturbances.

Soil information of this nature is often readily available from the USDA - Soil Conservation Service; therefore, we would not expect it to be difficult to obtain. Only through a thorough review of the soils that will be impacted and mitigation that will be employed to protect the soils, can a full assessment of environmental impacts, both direct and indirect, be made. For example, development of homes with septic tanks on soils unsuited to such use can result in degradation of water quality. The use of borrow areas can result in excessive erosion losses, prime farmland impacts, or a variety of other soil related impacts if these sites are not carefully selected. In order to keep soil related impacts to a minimum, relocation of public utilities should also be based on a consideration of soil characteristics. As each of the preceeding encompasses a major land disturbance, an understanding of the soils being disturbed is integral to understanding the total environmental impacts of the proposed action.

NONSTRUCTURAL ALTERNATIVE

The nonstructural plan (flood proofing) for flood control on Holes Creek should receive further consideration. This alternative is designed to prevent flood waters, up to the 100-year flood level, from entering structures. This can be accomplished by installation of permanent and/or semipermanent closures for various openings, installation of sewer gate valves, and waterproofing the exterior either by special coating or by construction of a new exterior cutoff wall (masonry) in the case of frame structures. This plan includes the purchase of about 24 acres of land along Holes Creek for environmental enhancement. Considering the nature of the environmental impacts usually associated with nonstructural alternatives for flood control, the level of analysis for this alternative is adequate.

were the levee alternative selected, the construction contract would include provisions for stabilization of borrow areas. Detailed plans for stabilization of alternatives not selected are not necessary for a survey level report.

There will be no induced development from relocation of utility lines. The extension of impacts of utility line relocation beyond the project construction impacts zone of effect would not be significant.

The Final EIS references soils information in the Appendix to the Main Report and in the Soil Survey of Montgomery County, Ohio USDA Soil Conservation Service. Site specific soil characteristics will be obtained in later stage planning. Soil conditions are not expected to be a major factor in utility relocations. There are no borrow areas in the selected plan.

Discussions with local interests covered both advantages and disadvantages of the plans. The disadvantages were paramount in the decision not to select the flood proofing plan. During flooding conditions homes would still be surrounded by floodwaters, and medical and fire service vehicles would be unable to reach homes to respond to emergencies. The treatment of residences within the protected area with this plan would be inequitable because some homes would not be suitable for flood proofing. Damage reductions for the nonstructural plan are least of the four plans.

Section 73 of the Water Resources Development Act of 1974 established a policy that full consideration be given to nonstructural alternatives for flood plain management. The National Environmental Policy Act of 1969 (under Section 101(b)(3)) charges the Federal Government with the responsibility to use all practical means, consistent with other essential considerations of national policy, to coordinate Federal plans to the end that the Nation may attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences. In as much as the nonstructural alternative is the environmental quality (EQ) plan, it should receive further consideration. Furthermore, while limiting the environmental impacts, the nonstructural alternative would provide 100-year flood protection to 272 residences out of 305 total units and a 55% reduction in average annual flood damage costs. Compliance with Executive Order 11988 should be attainable through implementation of this alternative. Considering the potential environmental impacts of the structural alternatives, we advise a thorough consideration of this environmentally preferable alternative. We realize the essential nature of citizen support for this type of project, and recommend consideration of a public education program to promote full public understanding of the advantages of nonstructural alternatives.

Attachment

SOIL INFORMATION

1. Detailed soil map (depict alternatives visually and with associated text).

    a. Scale 1:20000 (3.168 inches = 1 mile) or larger
    b. Delineated at the mapping unit level
    c. Legend

2. "Thumbnail description" of soil series.

    a. Name
    b. Depth
    c. Drainage
    d. Parent material
    e. Landscape position
    f. Profile description (general) by horizon

        (1) Color
        (2) Texture
        (3) Thickness

    g. Slopes
    h. Use
    i. Classification (USDA Soil Taxonomy)
    j. Soil capability subclass

3. Use of soil resource as a base for a wide variety of development alternatives may require all or most of the following soil characteristics for interpretive purposes.

    a. Depth to bedrock (hard, soft)
    b. Depth to cemented pan
    c. AASHTO Group Index Number (Evaluate the thickest layer between 10 and 60 inches and also the bottom layer)
    d. AASHTO Group Classification
    e. Depth to high water table (kind, months)
    f. Slope
    g. Flood hazard (frequency, duration, season)
    h. Potential frost action
    i. Shrink-swell potential
    j. Fraction greater than 3 inches (weighted average to 40 inches)
    k. UNIFIED Classification
    l. Liquid limit
    m. Plasticity index
    n. Moist bulk density
    o. Permeability rate
    p. Available water capacity
    q. Soil reaction (pH)
    r. Erosion factors (K, T)
    s. Wind erodibility group
    t. Organic matter percent
    u. Hydrologic group

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON 20426

IN REPLY REFER TO:

July 14, 1980

Colonel Thomas P. Nack
District Engineer
Corps of Engineers
P. O. Box 49
Louisville, Kentucky

Dear Colonel Nack:

I am replying to your request of June 9, 1980 to the Federal Energy Regulatory Commission for the Flood Control Project at West Carrolton, Ohio. This Draft EIS has been reviewed by appropriate FERC staff components upon whose evaluation this response is based.

The staff concentrates its review of other agencies' environmental impact statements basically on those areas of the electric power, natural gas, and oil pipeline industries for which the Commission has jurisdiction by law, or where staff has special expertise in evaluating environmental impacts involved with the proposed action. It does not appear that there would be any significant impacts in these areas of concern nor serious conflicts with this agency's responsibilities.

Comment noted.

Thank you for the opportunity to review this statement.

Sincerely,

Jack M. Heinemann
Advisor on Environmental Quality

FEDERAL ENERGY REGULATORY COMMISSION
CHICAGO REGIONAL OFFICE
230 SOUTH DEARBORN STREET, ROOM 3130
CHICAGO ILLINOIS 60604

June 26, 1980

Colonel Thomas P. Nack
District Engineer
Department of the Army
Louisville District Corps of Engineers
P.O. Box 59
Louisville, Kentucky 40201

Your Reference: ORLPD-F

Dear Colonel Nack:

This is in response to your recent request inviting our review and comments on the Draft Environmental Impact Statement for flood control improvements at West Carrollton, Ohio. Comments of this office are made in accordance with the National Environmental Policy Act of 1969 and the August 1, 1973 Guidelines of the Council on Environmental Quality. We reviewed the draft statement to determine the effect on matters concerning the Federal Energy Regulatory Commission's responsibilities. Such responsibilities stem from the Federal Power Act and the Natural Gas Act and relate to the licensing of non-Federal hydroelectric projects and associated transmission lines: participation in planning and development of Federal hydroelectric projects; certification for construction and operation of natural gas pipeline facilities, defined to include both interstate pipeline and terminal facilities; and the permission and approval required for the abandonment of natural gas pipeline facilities.

Comment noted.

Because the above-noted contemplated improvements would not pose a major obstacle to the construction or operation of such facilities and because the Draft does not indicate that existing natural gas or hydroelectric developments would be adversely affected, we have no specific comments.

These comments are of this office and therefore do not necessarily represent the views of the Federal Energy Regulatory Commission.

Thank you for the opportunity to comment on this.

Sincerely,

Lawrence F. Coffill

Lawrence F. Coffill
Regional Engineer

orbc

OHIO RIVER BASIN COMMISSION

Suite 208-20
Cincinnati, Ohio 45202

36 East Fourth Street
513/684-3831 (FTS)

July 22, 1980

Colonel Thomas P. Nack, District Engineer
U.S. Army Engineer District, Louisville
Post Office Box 59
Louisville, Kentucky 40201

Attention: Plan Formulation Branch, PD-F

Dear Colonel Nack:

This is in response to your letter of June 9, 1980, inviting comments on the "Interim Report for Water Resources Development Miami River, Little Miami River, and Mill Creek Basins, Southwest Ohio," - a study to determine the feasibility of providing flood control and related water resources improvements in the vicinity of West Carrollton, Ohio.

The initial phase of the water and land resources plan for the Great Miami River Basin was adopted by the Ohio River Basin Commission in April 1977, and it includes, in the adopted portion of the Baseline Record, the "West Carrollton Local Protection Project, Montgomery, Ohio." This action was taken by the Commission on April 26, 1974. Although this project is consistent with the plan as it exists today, any revision to the Great Miami River Basin Plan is being held in abeyance pending a final determination by Ohio on their participation in the Commission. The projects and programs appearing in the Baseline Record portion of the plan, however, are current as they relate to the federal agencies. Further, the study also appears in the Commission's "1980 Report of Regional Priorities for Fiscal Years 1981-85", with a priority for fiscal year 1981.

Thank you for keeping us informed on this project study.

Sincerely,

Fred J. Krumholtz

Fred J. Krumholtz
Chairman

cc: Ohio: Dr. Robert W. Teater
Mr. L. Bennett Coy
USEPA: Office of Federal Relations (3 copies)
Army: MG Harry A. Griffith
Att: Mr. Frank Guiher

Comments noted.

STATE CLEARINGHOUSE

80-08-01 P
08

Colonel Thomas P. Nack, District Engineer
Louisville District Corps of Engineers
Plans Formulation Branch
600 Federal Place, Room 622
Louisville, Kentucky 40202

RE: Review of Environmental Impact Statement/Assessment
Title: Draft Environmental Impact Statement-Flood Control Improvements at West Carrollton, Ohio. Montgomery County
SAI Number: 36-422-0009

Dear Colonel Nack:

The State Clearinghouse coordinated the review of the above referenced draft environmental impact statement.

This environmental report was reviewed by all interested State agencies. Specific comments indicate that Plan D, the tentatively selected plan, provides the highest reduction in average annual flood damages and has a favorable benefit to cost ratio (1.4). All factors, such as environmental impacts, project costs, and desires of the local sponsor should be considered in selecting the most acceptable plan for flood control and water resources development. Because of the severity of impacts associated with the tentatively selected plan the Final Environmental Impact Statement should insure that maximum consideration has been given to preserving existing natural resource values and mitigating impacts.

The tentatively selected plan (500 year channel improvement) will result in severe adverse impacts to the stream ecosystem of Holes Creek. Because many of the effects of this proposal are long-term and will reduce the long-term productivity of Holes Creek, there is concern that mitigation measures would be implemented and would be effective.

Other concerns indicate that the stream bank and riparian vegetation should be preserved to the extent possible along all segments of the project to provide habitat and help maintain water quality by shading the stream. The plan which retains as much existing streambank vegetation as possible with restricting work to one side only is commendable. The replanting of disturbed areas should also allow for the succession of native species after replanting and erosion control has been effected.

Responses to specific comments are attached to inclosed letters.

The location of the low flow channel in close proximity to vegetative cover on the south and west banks is most important to the long-term productivity of the stream. If feasible, the low flow channel should be incorporated in the downstream section between the Dixie Highway and Interstate 75 with planting along the left descending bank. This could help provide badly needed mitigation for losses incurred by relocating the natural stream channel.

Consideration should also be given to preserving the meanders of Holes Creek that will be cut off as a result of channel relocation. It is recommended that cut off oxbows be preserved to minimize habitat losses. Even with dredging to conform the bottom elevation with the low flow channel, environmental benefits would be derived from this additional aquatic and riparian habitat. If feasible a hydraulic connection should be maintained between the proposed low flow channel and the existing Holes Creek channel through culverts or by incorporating the meanders as part of the low flow channel.

The listed issues should be addressed in the Final Environmental Impact Statement as well as the effectiveness of mitigation measures proposed in the draft document (See the attached comments). If you have any questions, contact Richard L. Kostecka of the Ohio Department of Natural Resources, Fountain Square, Columbus, Ohio, 43224, (614) 466-8387.

Additional comments state that Draft Reports received indicate on pages 7 and 55 that "as a result of extensive industrial and suburban landscape alterations, the infield findings of an archaeological reconnaissance were completely negative." The Regional Archaeological Preservation Office at Wright State University has indicated that it is unaware of any such archaeological reconnaissance. If such a reconnaissance has been conducted, the Ohio State Historic Preservation Office would like to review the report so that their office can make constructive comments pertaining to this project (See the attached comments). Contact, Jean Montgomery of the State Historic Preservation Office, I-71 and 17th Avenue, Columbus, Ohio 43211, (614) 466-1500.

Thank you for the opportunity to review this draft environmental impact statement. Upon completion of your final environmental impact statement, please submit 6 copies to the State Clearinghouse for further processing.

Sincerely,

Judith Y. Brachman Lew

Judith Y. Brachman
Administering Officer

JYB:rmr
cc: Mike Colvin, DNR
Beth Whitman, OEPA
Richard Kostecka, DNR
Jean Montgomery, SHPO

STATE CLEARINGHOUSE ENVIRONMENTAL

IMPACT STATEMENT COVER SHEET

18

Date Review Started 80-06-13 SAI Number 36-422-0009

Return No Later Than July 14, 80 Draft ✓

Final ____

Summary, full copy to follow ____

Description Flood Control Improvements at West Carrollton, Ohio

Agency List:

Sent		Number of Copies	Returned
✓	Ohio Environmental Protection Agency Attn: Beth Whitman	2	
✓	Department of Natural Resources Attn: Mike Colvin	2	
✓	Historic Preservation Office Attn: Bert Drennen	1	
✓	Department of Transportation Attn: Charles Tripp	2	
✓	Department of Economic & Community Dev. Attn: Bob Freedman	1	
✓	Department of Health Attn: Bob Schutz	1	
✓	Department of Energy Attn: Chris Schlemmer	1	
✓	Department of Agriculture Attn: Ed Kirby	1	

RECEIVED
JUL 30 1980

____ No comment or further interest

____ Comments on overleaf

✓ Comments attached

OHIO DEPARTMENT OF NATURAL RESOURCES
RECEIVED
JUN 25 19..
DIVISION OF WILDLIFE ADMINISTRATION

[signature] Signature of Reviewer

Richard L. Kotecki Name of Reviewer (Print or Type)

Signature of Executive or Deputy

Date

ODNR

Ohio Department of Natural Resources

COMMENTS ON DRAFT ENVIRONMENTAL STATEMENT
WATER RESOURCES DEVELOPMENT
WEST CARROLLTON, OHIO
(LOUISVILLE DISTRICT, CORPS OF ENGINEERS)

The Department of Natural Resources has completed an interdisciplinary review of the Draft Environmental Statement (DEIS) for the proposed Water Resources development project at West Carrollton, Ohio. In general, the DEIS adequately addresses issues identified by the Department and listed in the May 22, 1979 letter to the Corps of Engineers (Appendices Exhibit 7).

The Corps of Engineers has done an excellent job of summarizing alternative methods of dealing with flooding problems in West Carrollton. Plan D, the tentatively selected plan, provides the highest reduction in average annual damages and has a favorable benefit to cost ratio (1.4). However, damage reduction under Plan C would be only 5 percent less and the benefit to cost ratio of this plan is 2.0. Total cost of Plan D is $5,970,000, while Plan C would cost $3,760,000. Local costs would be $1,240,000 under Plan C and $1,830,000 under Plan D. Plan A, the "Nonstructural Alternative" is the least expensive overall, has the highest benefit to cost ratio at 2.5, and is the best plan environmentally.

Comment noted.

The tentatively selected plan (500 year channel improvement) will result in severe adverse impacts to the stream ecosystem of Holes Creek. Because many of the effects of this proposal are long-term and will reduce the long-term productivity of Holes Creek, the Department is concerned that mitigation measures would be implemented and would be effective. The proposed riffle-pool complex's, for instance, should remain functional throughout the life of the project. Of equal concern is the removal of streamside vegetation. Stream bank and riparian vegetation should be preserved to the extent possible along all segments of the project to provide habitat and help maintain water quality by shading the stream.

Mitigation measures will be implemented as described in the EIS. Additional refinements may be added in post-authorization stages. Streambank and riparian vegetation will be preserved where possible.

The plan which retains as much existing streambank vegetation as possible with restricting work to one side only is commendable. The replanting of disturbed areas should also allow for the succession of native species after replanting and erosion control has been effected. The design may have already given maximum consideration to shade providing cover, nevertheless, we cannot over stress the importance of such cover to the low flow channel. The location of the channel in close proximity to

The low flow channel generally follows the left (south and west) banks except where it has been placed next to the unexcavated right bank where natural tree cover will remain.

vegetative cover on the south and west banks is most important to the long-term productivity of the stream. If feasible, the low flow channel should be incorporated in the downstream section between the Dixie Highway and Interstate 75 along with planting along the left descending bank. This would help provide badly needed mitigation for losses incurred by relocating the natural stream channel.

Consideration should also be given to preserving the meanders of Holes Creek that will be cut off as a result of channel relocation. We recommend that cut off oxbows be preserved to minimize habitat losses. Even with dredging to conform the bottom elevation with the low flow channel, environmental benefits would be derived from this additional aquatic and riparian habitat. If feasible a hydraulic connection should be maintained between the proposed low flow channel and the existing Holes Creek channel through culverts or by incorporating the meanders as part of the low flow channel. The Final Environmental Statement (FEIS) should address these issues as well as the effectiveness of mitigation measures proposed in the draft document.

Regarding the alternate cost sharing figures identified through the DEIS, we do not believe it appropriate to state or imply alternative cost sharing figures when only one conforms to the governing federal law. The President's proposal to modify cost sharing policy is still only a proposal.

In conclusion, it is the position of the Department at this time, that Alternatives A, C, and D all have some merit. Plan D provides the highest reduction in average annual flood damages. All factors, such as environmental impacts, project costs, and desires of the local sponsor should be considered in selecting the most acceptable plan for flood control and water resources development. Because of the severity of impacts associated with the tentatively selected plan the FEIS should insure that maximum consideration has been given to preserving existing natural resource values and mitigating impacts.

Because of the relatively small size of the cutoff channels it was decided that they would be filled and converted to terrestrial habitat or utilized for recreation facilities. The possibility of retaining the cutoff channels could be considered in later stage planning and design.

The Corps of Engineers guidelines require that the President's proposed cost-sharing policies be incorporated into recommendations for Federal participation.

Comment noted.

18

Date Review Started 80 06-13 SAI Number 36-482-[illegible]9

Return No Later Than July 14, 80 Draft ✓

Final ____

Summary, full copy to follow ____

Description Flood Control Improvements at West Carrollton, Ohio

Agency List:

Sent		Number of Copies	Returned
✓	Ohio Environmental Protection Agency Attn: Beth Whitman	2	
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✓	Historic Preservation Office Attn: Curt Drennen	1	
✓	Department of Transportation Attn: Charles Tripp	2	
✓	Department of Economic & Community Dev. Attn: Bob Freeman	1	
✓	Department of Health Attn: Bob Schutz	1	
✓	Department of Energy Attn: Chris Schlemmer	1	
✓	Department of Agriculture Attn: Ed Kirby	1	

____ No comment or further interest

____ Comments on overleaf

X Comments attached

OHIO HISTORIC PRESERVATION OFFICE - Ohio Historical Center I-71 & 17th Avenue
Columbus, Ohio 43211 (614) 466-1500

A-95 REVIEW COMMENTS
S.A.I. # 36-422-0009
Flood Control Improvements at
West Carrollton, Ohio
June 23, 1980

The Draft Reports which this office has received indicate on pages 7 and 65 that "as a result of extensive industrial and suburban landscape alterations, the infield findings of an archaeological reconnaissance were completely negative." The Regional Archaeological Preservation Office at Wright State University has indicated that it is unaware of any such archaeological reconnaissance. If such a reconnaissance has been conducted, this office would like to review the report which resulted. For this office to make constructive comments pertaining to this project, it needs to review the reconnaissance report.

We look forward to receiving this additional document for review and comment in the near future. Thank you in advance for your continued coordination regarding the cultural resources within the referenced project area.

See attached.

Responses to comments appear with attached letter.

Regional Office: Wright State University
Laboratory of Anthropology Dayton, Ohio 45431 (513) 873-2247

June 16, 1980

Department of the Army
Louisville District Corp of Engineers
P.O. Box 59
Louisville, Kentucky 40201

ATTENTION: Plan Formation Branch, PD-F

REGARDING: Draft Survey Report and Draft Environmental Impact Statement for flood control improvements at West Carrollton, Ohio

Dear Plan Formation Branch, PD-F:

On June 2, 1980, I provided comments to Mr. Bruce M. Cowan concerning the above referenced project. I indicated that an archaeological survey and assessment of resources located during survey was being recommended by this office to the Reviews and Compliance Department, Ohio Historic Preservation Office. The reasons for this recommendation were the archaeological sensitivity of the project area, the potential for project impact upon such resources, and no professionally sponsored survey and assessment of the project area.

The Draft Reports which I have just reviewed, received following submission of my initial comments to Mr. Cowan, indicate on pages 7 and 65 that "as a result of extensive industrial and suburban landscape alterations, the infield findings of an archaeological reconnaissance were completely negative." The Regional Office is unaware of any such archaeological reconnaissance. If such a reconnaissance has been conducted, the Regional Office would like to review the report which resulted. For the Regional Office to make constructive comments pertaining to this project, it needs to review the reconnaissance report. Please respond to this request at the address given above.

Thank you for your cooperation.

Sincerely,

Alan C. Tonetti

Alan C. Tonetti
Regional Archaeologist

ACT/cls

cc: Bert Drennan, Ohio Historic Preservation Office

Ohio Historic Preservation Office
Ohio Historical Center I-71 & 17th Avenue Columbus, Ohio 43211 (614) 466-572

In a telephone conversation between Mr. Tonetti and Mr. Donald B. Ball (District Archaeologist) of this office subsequent to the receipt of this letter by the Louisville District, the misunderstandings of the regional SHPO office were clarified and reconciled.

Two professional archaeologists from the Louisville District met with Mr. Tonetti in his office at Wright State University on the morning of 24 August 1978 and explained to him both the nature of the proposed action and the need for appropriate site location and information. This data was supplied by Mr. Tonetti to the Corps archaeologists at that time. In-field pedestrian reconnaissance of the project area was conducted during the afternoon of 23 August and late morning and early afternoon of 24 August. The Corps is aware of the archaeological sensitivity of the area, and page 27 of the DEIS recommends "that the project area be monitored by a professional archeologist during any future construction activities in the area."

Page 28 of the DEIS states that "Coordination with the State Historic Preservation Officer was accomplished through personal communication with his regional representative." A report of field work was not prepared since such a document would have contributed no additional information regarding the presence of archaeological sites not already known to the Ohio Historic Preservation Officer.

THE OHIO DEPARTMENT OF NATURAL RESOURCES

TO: Judith Y. Brachman, Administering Officer
State Clearinghouse

DATE: July 30, 1980

FROM: Roger D. Hubbell, Chief
Office of Outdoor Recreation Services

Subject: DEIS - Water Resources Development Project, West Carrollton, Ohio, (SAI #360422-0009) U.S. Corps of Engineers, Louisville District

The Department of Natural Resources has completed an interdisciplinary review of the above reference project. The Department's comments are attached and they should be addressed in the Final Environmental Statement.

Roger D. Hubbell

RDH/jd

Enclosure

RECEIVED

APPENDIX D
HYDROLOGY AND HYDRAULICS

APPENDIX D

HYDROLOGY AND HYDRAULICS

Table of Contents

Table of Contents (Continued)

TABLES

Table of Contents (Continued)

PLATES

Table of Contents (Continued)

PLATES (Continued)

ADDENDA

Appendix D
Hydrology and Hydraulics

This appendix provides the methodology and assumptions used in establishing the hydrologic conditions of Holes and Owl Creeks. Frequency curves were developed at hypothetical gages for each reach and flood profiles established. From these data, the extent of flooding and flood damages could be developed.

Rainfall-Runoff Procedures and Flood Probability

The absence of long-term stream gaging stations, the changing effects of urbanization, and the need to predict future conditions dictated that a rainfall-runoff approach needed to be used to determine streamflows. The Soil Conservation Service (SCS) procedure was chosen because of its adaptability for ungaged areas and its reflection of land use. Another advantage of SCS procedures was its availability in HEC-1, a generalized computer program developed by the Hydrologic Engineering Center, U.S. Army Corps of Engineers. "Urban Hydrology for Small Urban Watersheds," Technical Release No. 55, U.S. Department of Agriculture, Soil Conservation Service, was followed. A unit hydrograph based upon time of concentration, drainage area, and the standards of volume under the rising side was used. A computation interval of 1 hour was used in the Holes Creek computations. Fifteen-minute intervals were used with Owl Creek computations.

SCS curve numbers were determined by weighting values obtained from Table 2-2 of SCS Technical Release No. 55. Soil types were gathered from "An Inventory of Ohio Soils - Montgomery County, Ohio" and land uses (present conditions) were taken from aerial photographs.

The validity of these rainfall-runoff procedures was checked by reproduction of the January 1959 flood peak discharge at Mad River Road. The published peak discharge of 4,730 cfs was calculated from a slope-area measurement by the Miami Conservancy District. The peak discharge generated by the HEC-1 model for the January 1959 event of 4,570 cfs was acceptable. The SCS curve number represented 1959 conditions. Curve numbers from Table 2-2 of Technical Release No. 55 are for antecedent moisture condition II (normal). Curve numbers for the January 1959 flood were adjusted to values slightly greater than antecedent moisture condition III (wet) because of the following statement in the Special Weather Summary of Climatological Data for January 1959: "Storm totals . . .were generally less than in 1913, but rainfall intensities were greater. Furthermore, the soil was still frozen, with the result that the percentage of runoff was unusually high."

A "synthetic storm" technique was used in calculating floods of specified frequencies. The frequency rainfall increments were arranged in a sequence based on a study of five area storms of records. These were the storms of January 1959, March 1964, May 1968, July 1973, and June 1974. The following items were investigated to see if a pattern existed in the above storms.

a. Percent of the total storm length used for the initial loss.

b. Percent of the total storm rainfall to be considered as initial loss.

c. Percent of the total storm length considered as the "flood producing" portion of the storm.

d. Percent of the total storm rainfall considered as the "flood producing" portion of the storm.

Table D-1 shows the results of this investigation. The percentages show a favorable pattern, even though the storms occurred during different seasons of the year. Consequently, the adopted percentages were applied to TP 40 rainfall. Plate D-1 shows the mass rainfall curve for the January 1959 storm, with the breakout of the above-described percenages. This arrangement was applied to various frequency rainfall recurrence intervals. These data, combined with the SCS parameters, were imputed into a HEC-1 model to develop flow hydrographs for these same recurrence intervals.

Discharge values obtained by the "synthetic storm" procedure described above were compared with a rating curve below Mad River Road determined by use of HEC-2, a computer backwater program developed by the Hydrologic Engineering Center. Although the rating curve for Holes Creek at the Mad River Road gage is questionable, the gage provides a check of the general relationship between various frequencies. An approximate stage-frequency curve was developed by fitting plotting positions to stage data recorded between 1961 and 1976. An adjustment to SCS curve numbers reflecting antecedent conditions was made to obtain better agreement with the shape of the approximate stage-frequency curve. Variable curve numbers were used. A transition from curve numbers corresponding to Type II antecedent conditions at a return interval of 0.3 years to curve numbers corresponding to Type III antecedent conditions at a return interval of 20 years improved the shape of the stage-frequency curve. Curve numbers between return intervals of 0.3 years and 20 years varied linearly on a semilogarithmic plot. These results indicate that rarer flood events occur when conditions are conducive to runoff. This relationship was used for flow determinations in this study.

TABLE D-1

STORM PATTERNS USED FOR STUDY

Item	January 1959	March 1964	May 1968	July 1973	June 1974	Adopted Percent
Percentage of Total Storm Length Used for the Initial Loss	36	30	10	17	22	25
Percent of Total Storm Rainfall Considered as Initial Loss	14	13	15	15	7	13
Percent of the Total Storm Length Considered as the Main Part of the Storm	44	50	43	30	35	40
Percent of the Total Storm Rainfall Considered as the Main Part of the Storm	86	81	82	82	85	83

Another criterion used to judge the reasonableness of the above procedure was the fact that the January 1959 flood represents about a 25-year event on gaged streams in this part of Ohio with a size similar to Holes Creek.

Future conditions were computed by similar procedures. Curve numbers and overland travel times were based upon predicted future land uses (see Figure A-3). It was assumed that channel "n" values for future conditions would be reduced by 10 percent from present conditions.

The Standard Project Flood (SPF) was determined using HEC-1 and SCS curve numbers (CN) developed by procedures described above. The CN's used were those for the 100- and 500-year frequency floods. HEC-1 uses procedures in EM 1110-2-1411 to compute a SPF. On a frequency basis, the SPF plots in excess of a 1,000-year flood. This rare event is attributed to the pattern rainfall required for the SPF.

Backwaters from the Miami River were determined from frequency-discharges coordinated with the Miami Conservancy District in 1977 for 10-year and larger events. Backwaters from the Miami River for the SPF were determined from discharges developed by the MCD in connection with studies at Ross and Franklin, Ohio. The elevations for the 10-year and greater frequency floods were taken from HEC-2 studies for the Montgomery County, Ohio Flood Insurance Studies at the mouths of Owl Creek and Holes Creek. Elevations for a 2-year event were obtained from existing profiles. The SPF elevation on the Miami River at Holes Creek was determined from rating curves developed from HEC-2 runs. Miami River data were adjusted to the NGVD, 1929. Major events on the Miami River will not be coincident with events on Owl Creek and Holes Creek because of their difference in size. Plates D-2, 3, and 4 show the natural discharge-frequency curve on Holes and Owl Creeks. The SPF discharges are not given on these curves since their recurrence intervals plot in excess of the 1,000-year flood. For additional information concerning the derivation of the discharge frequency curve for Holes Creek, see Addendum D-1 at the end of this Appendix.

Water Surface Elevations

Results obtained from initial studies indicated that water movements were complex and a detailed study was required. Each stream contains reaches where portions of the flow can spill into adjacent areas. Flow remaining in the stream may spill out at other locations downstream. Additional inflow is contributed by tributary creeks. Water that has spilled out may enter ponding or storage areas. The storage available modifies flow out of these locations. Outflow from ponding areas is also dependent upon road elevations and other topographic features. Water from ponding areas may enter other ponding areas, travel over land, or enter the same or a different stream.

Where complicating factors were not involved, water surface profiles were calculated using the HEC-2 computer program. This was possible only in the upper reaches of Holes Creek. The HEC-2 model for Holes Creek was compared with high water data obtained by the Miami Conservancy District for the January 1959 profile. This comparison was not applicable to parts of Holes Creek because of channel changes following the 1959 flood.

The following general procedures were used to keep track of water movements where spill and storage were involved.

a. Identify study areas that involve spill or storage analysis.

b. Calculate discharge hydrographs by methods already discussed.

c. Determine ratings of discharge in stream versus elevation. Use HEC-2 results and pressure and weir flow equations.

d. Determine ratings of discharge spilling from stream versus elevation. Weir flow was assumed.

e. Determine the amount of storage available in ponding areas. Contours were based upon available mapping or spot elevations.

f. Rate outflow points from storage areas using their flow and pressure flow equations. Nominal discharge rates were assumed for sewer system outflows.

g. Working with the entire hydrographs for a range of events (1-year, 5-year, 25-year, 100-year, 500-year, and SPF) follow the movement of water through the stream system. This included hydrographs of water spilling from the stream, routing of hydrographs through storage in ponding areas, and hydrographs of water that may be reentering the stream. Streamflow hydrographs may be modified again by storage induced by restrictive roads and bridges.

h. If the initial estimate of water movement did not include all areas that would be affected (as determined by studying results of the above), then make proper changes and proceed through the steps again.

i. Develop frequency curves and profiles from elevations determined by step backwater computations, hydrograph analysis, and backwater from the Miami River.

j. For modified conditions, changes were made to reflect the modification and the hydrographs reanalyzed.

An example of flooding from multiple sources is the ponding area between Holes Creek and Owl Creek immediately upstream of Interstate 75 and west of Owl Creek. Low frequency events are caused by spill from Owl Creek and local runoff. Larger events include spill from Owl Creek and Holes Creek along with local runoff. A ridge separates Holes Creek from this area. When elevations on Holes Creek are above this ridge, water can spill into the ponding area

which already has spill from Owl Creek and local flow. Because it is larger in drainage area and the hydrograph has a longer duration around the peak, Holes Creek becomes the dominant flood source. At more extreme frequencies, water from the Miami River can back into the ponding area. The extremely lengthy flood peak on the Miami and large volume of water would quickly occupy available storage in the ponding area and an equal water surface would exist on both sides of the ridge. The range of frequency throughout which each flood source controls would vary depending upon conditions (present or future, and natural or modified). See Addendum D-2 for additional information on derivation of water surface profiles.

Plates D-5, 6, 7, and 8 give natural frequency profiles on Holes and Owl Creeks. The SPF profiles are shown on these plates for Holes Creek only. Plates D-10 through D-18 show the natural elevation-frequency curves on Holes and Owl Creeks. Plate D-19 shows the 100-year and SPF limits for present and future conditions.

Degree of Protection and Design Consideration

Results obtained from studies of different alternatives indicated a high degree of protection could be afforded for Holes Creek. Study of alternatives on Owl Creek yielded no viable project, and was therefore discontinued from further studies.

The degree of protection selected for detailed studies was the 500-year frequency flood, future condition. The type of improvement was channel enlargement, accompanied by bridge modification and/or bridge replacement. The reach of stream selected for improvement (I-75 to above Lamme Road) has no adverse impact on downstream conditions since the improvement is at the lower reach of Holes Creek, and the receiving stream is large in comparison to Holes Creek.

Backwater influence from the Miami River was used in determining channel sizes up to Springboro Pike. The plans by MCD to restore a low flow dam on the Miami River at West Carrollton would not impact on backwater flooding along lower Holes Creek. The design elevation at Springboro Pike was the 500-year Miami River backwater. The selected size raised the 500-year elevation at Springboro Pike slightly above the 500-year backwater elevation. The channel size from Springboro Pike to above Lamme Road was designed to actual channel and overbank conditions rather than a backwater situation. Table D-2 shows the design feature for the 500-year channel improvement plan.

Replacement or modification of bridges or slopes is required at Central Avenue (Mile 0.24), East Dixie Drive (Mile 0.26), Conrail Railroad (Mile 0.34), and Springboro Pike (Mile 0.62). The modification to Central Avenue and East Dixie Drive presents no structural problems. The Conrail Railroad will be totally replaced. The Springboro Pike bridge can be modified by increasing the bottom width to 144 feet, with 1:1 side slopes, instead of replacing the entire structure. This would be adding one 40-foot span.

This proposed concrete channel will be continued to the downstream side of the trucking terminal on the right bank. Above Springboro Pike, an environmental channel is recommended, per the U.S. Fish and Wildlife Service. See Appendix B for a description of this environmental channel.

Design channel velocities for the channel improvement range from 7 to 8.5 feet per second. A flat slope of 1V:6H for the grass-lined channel above Springboro Pike to Lamme Road was used on the left bank only for the environmental channel. The toe of this excavation was riprapped 2 vertical feet up the bank to stabilize the bank from eroding at these velocities. The right bank will be maintained at existing conditions in this reach as much as possible for environmental reasons. The channel below the concrete portion will be riprapped to 1V:3H. Riprap was used because of the restrictive nature

TABLE D-2

DESIGN FEATURES FOR 500-YEAR CHANNEL IMPROVEMENT PLAN

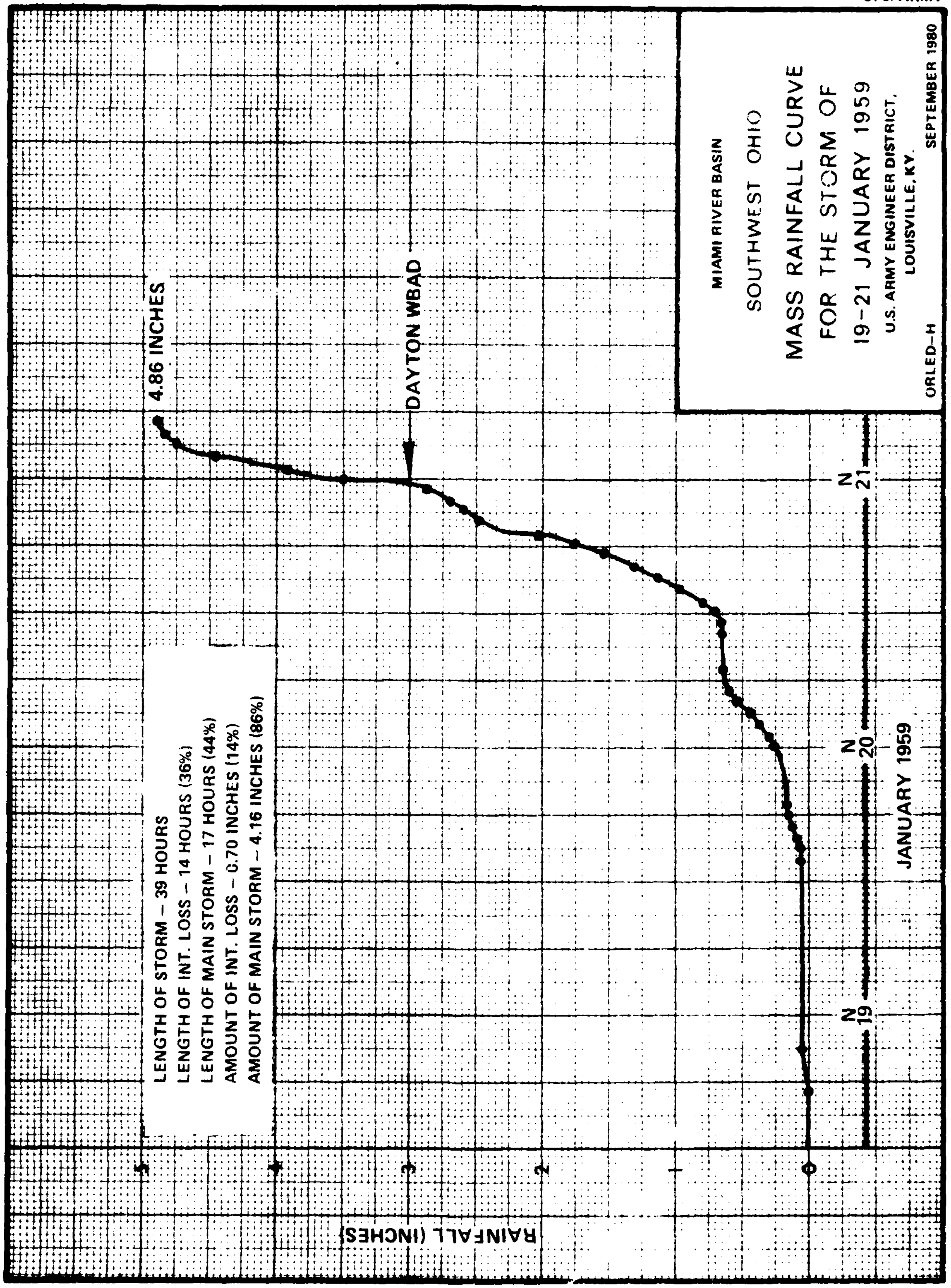
Channel Improvement Plan 1/	Interstate 75 Northbound to East Dixie Drive	East Dixie Drive to Conrail Railroad Bridge	Conrail Railroad to Springboro Pike	Springboro Pike to Lamme Road	Lamme Road to About 1,000 Feet Upstream
PLAN D 500-Year Plan	About 800 feet; 60-foot bottom width; 3:1 riprap slopes	About 500 feet; bottom widths vary from 100 to 160'; 3:1 riprap slopes	About 1,400 feet; bottom widths vary from 144' to 200'; side slopes vary from 3:1 riprap to vertical concrete	About 3,800 feet; bottom widths vary from 110' to 165' (avg. 142'); left bank slope @ 6:1 and grass; right bank slopes remain as is.	About 1,000 feet of slope improvements with 3:1 riprap and gabions; bottom width varies from 100 feet to natural

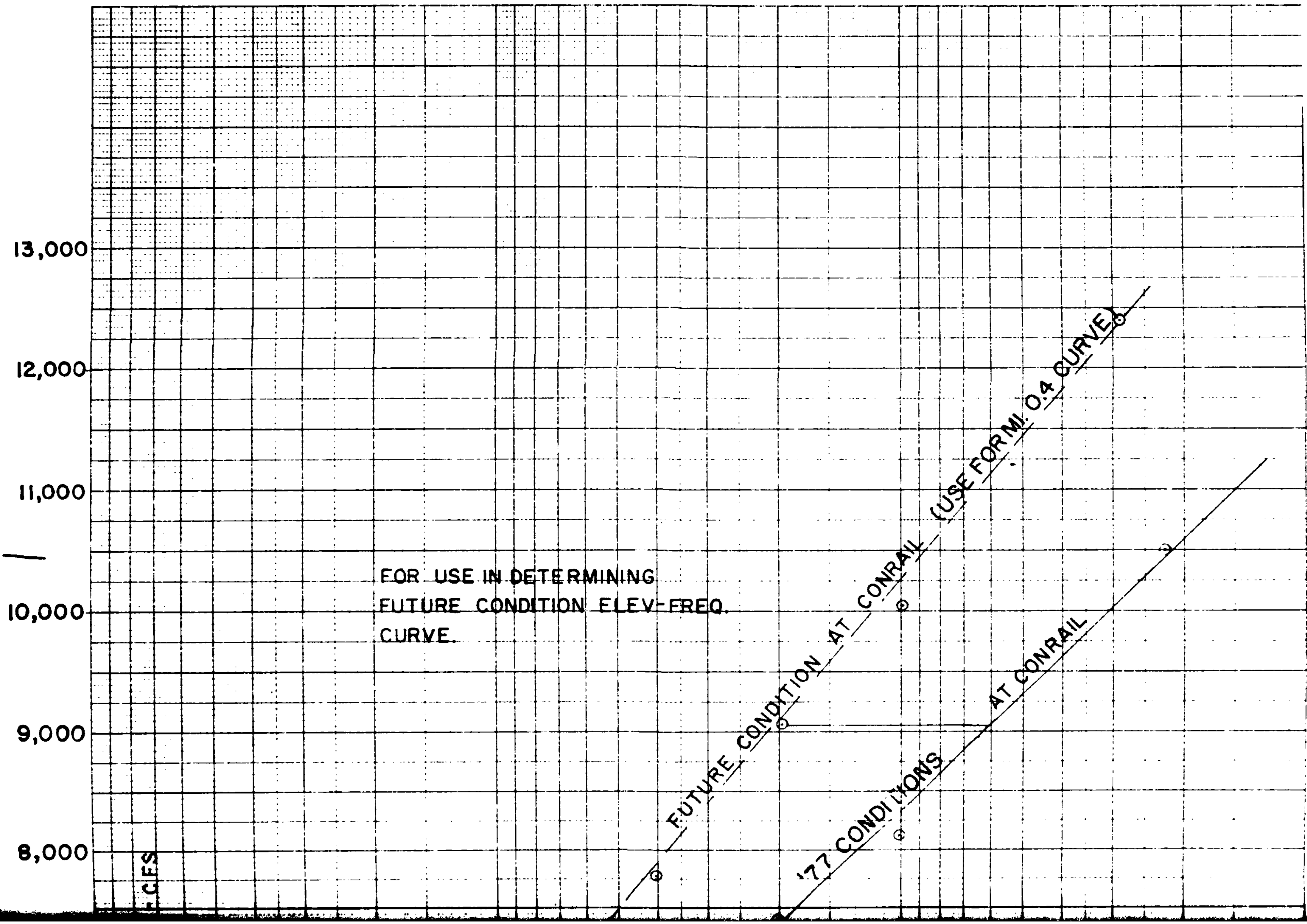
1/ Transitions and bridges are included in identified segments.

of the area and also to reduce the cost of larger bridge structures. Additional information on riprap design is contained in Addendum D-3. The replacement of Central Avenue and East Dixie Drive is not required when riprapped slopes are used. In addition, a smooth uniform flow condition results. No sediment studies were made on Holes Creek. Consequently, no estimate was made for sediment deposition during the project life, or during the design flood.

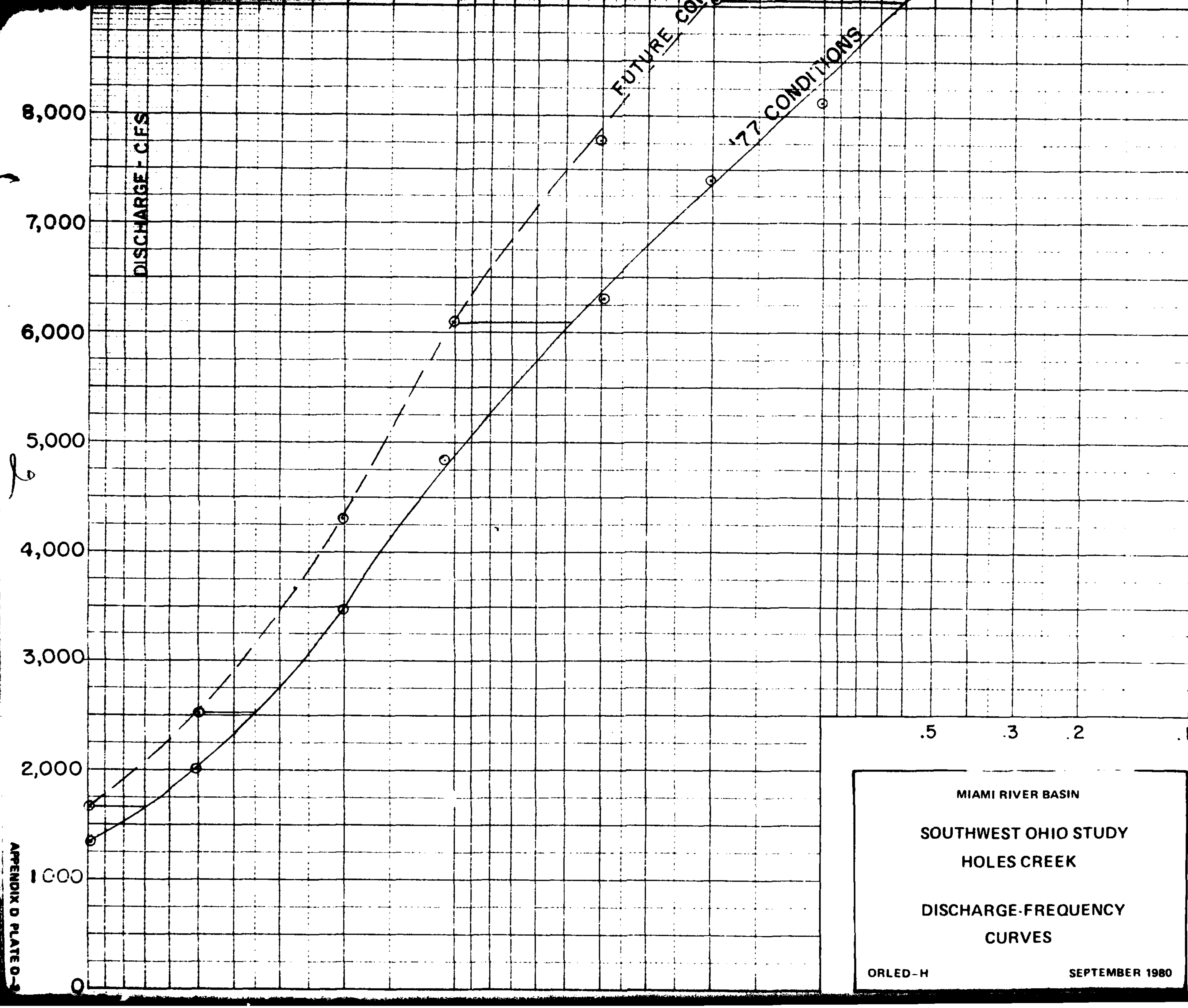
Plate D-9 shows the modified SPF and 100-year flood profiles for the recommended plan. As can be seen, there are no adverse impacts through or above the project reach. Plates D-10 through D-13 show the modified elevation-frequency curves at specific points on Holes Creek. Plate D-20 shows the present and future SPF limits and the 500-year future limits, respectively, as modified by the selected plan.

Plate D-22 shows the modified profiles for the NED (25-year) plan. Addendum D-3 provides additional information on the modified conditions in respect to velocities and duration.


MIAMI RIVER BASIN
SOUTHWEST OHIO
MASS RAINFALL CURVE
FOR THE STORM OF
19-21 JANUARY 1959
U.S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.
ORLED-H
SEPTEMBER 1980
4.86 INCHES
DAYTON WBAD
LENGTH OF STORM – 39 HOURS
LENGTH OF INT. LOSS – 14 HOURS (36%)
LENGTH OF MAIN STORM – 17 HOURS (44%)
AMOUNT OF INT. LOSS – 0.70 INCHES (14%)
AMOUNT OF MAIN STORM – 4.16 INCHES (86%)
RAINFALL (INCHES)
5
4
3
2
1
0
N 19
N 20
N 21
JANUARY 1959



13,000
12,000
11,000
10,000
9,000
8,000
- CFS
FOR USE IN DETERMINING
FUTURE CONDITION ELEV-FREQ.
CURVE.
FUTURE CONDITION AT CONRAIL (USE FOR MI. 0.4 CURVE)
'77 CONDITIONS AT CONRAIL

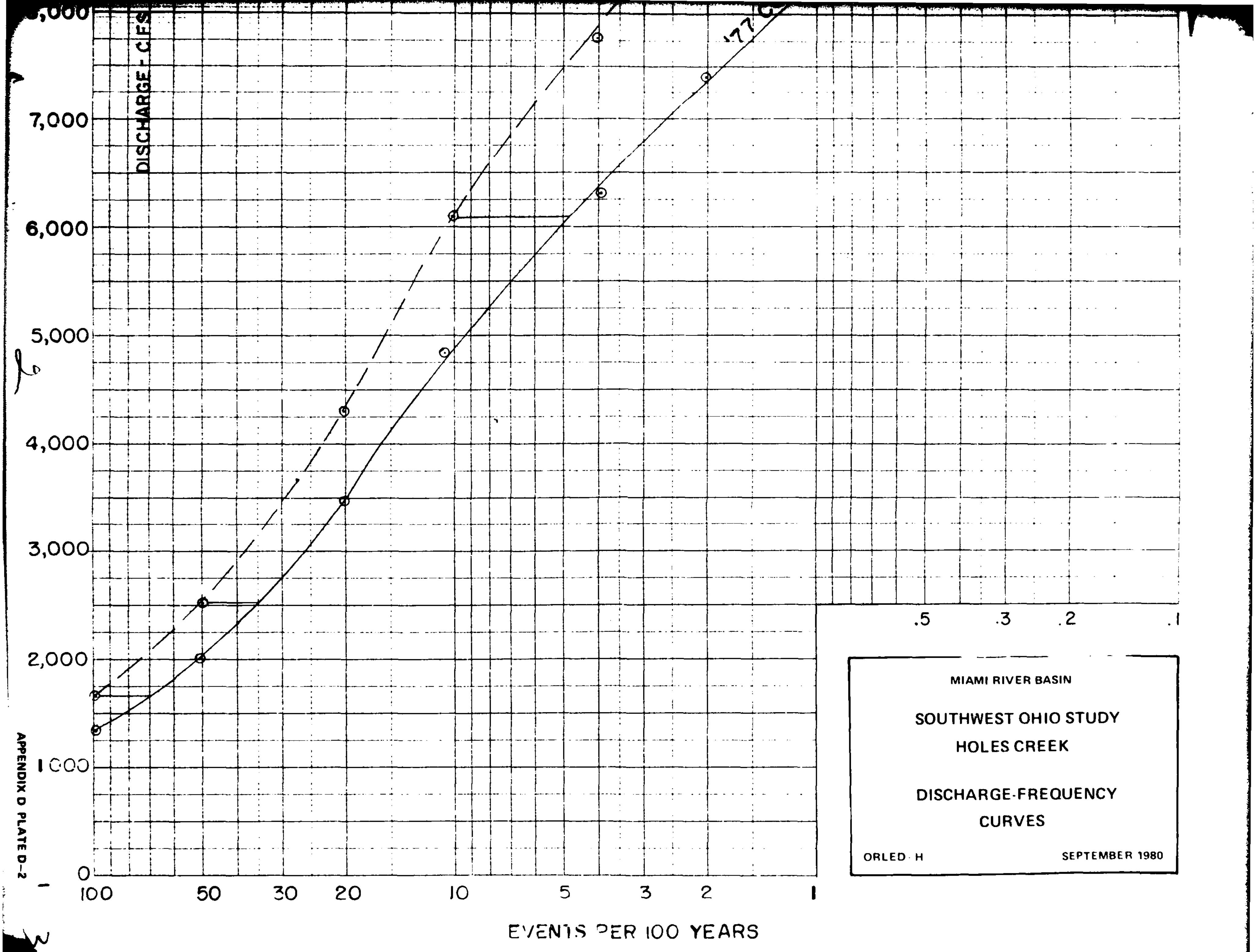


MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY
HOLES CREEK

DISCHARGE-FREQUENCY
CURVES

ORLED-H SEPTEMBER 1980



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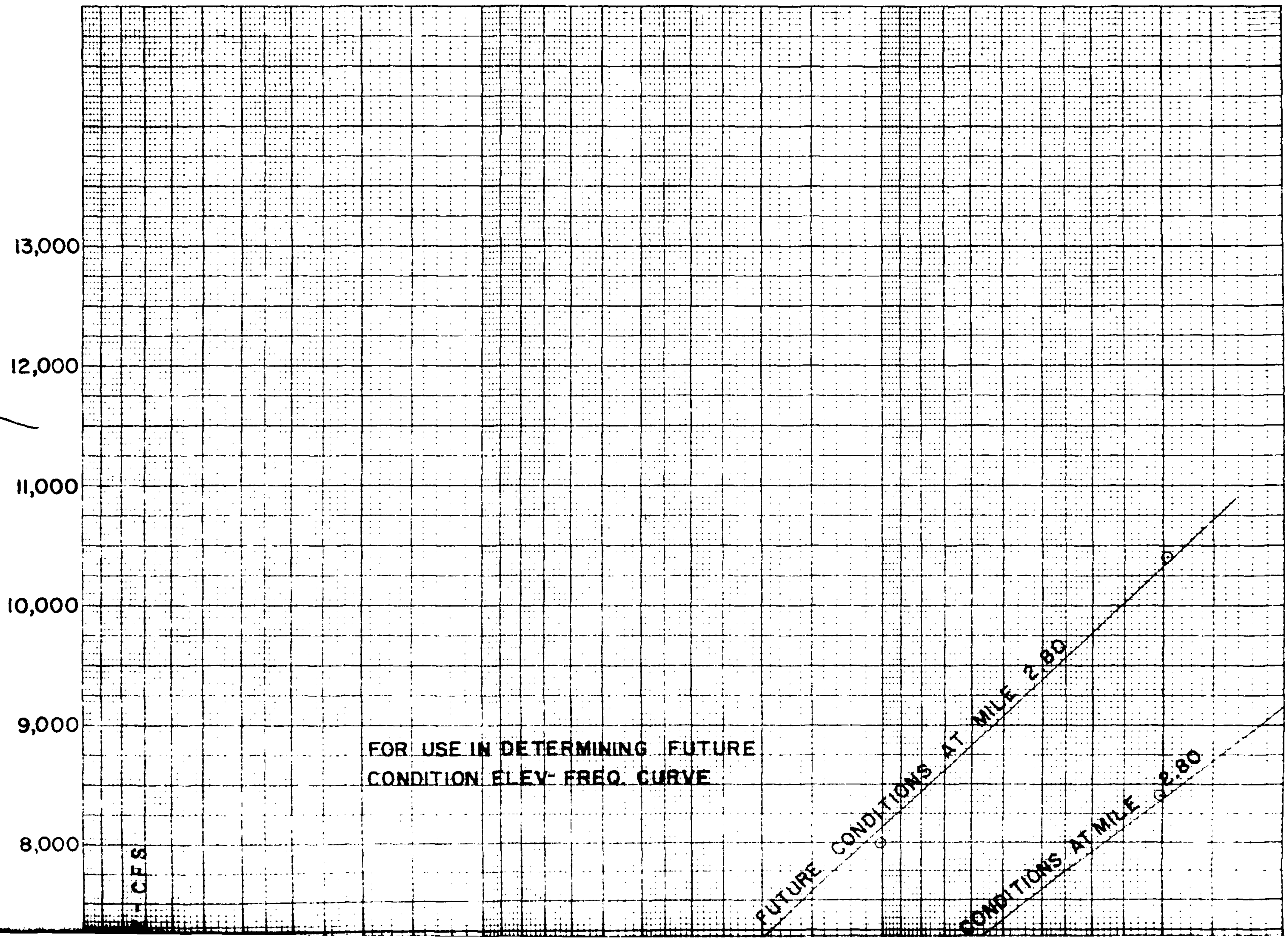
SOUTHWEST OHIO STUDY

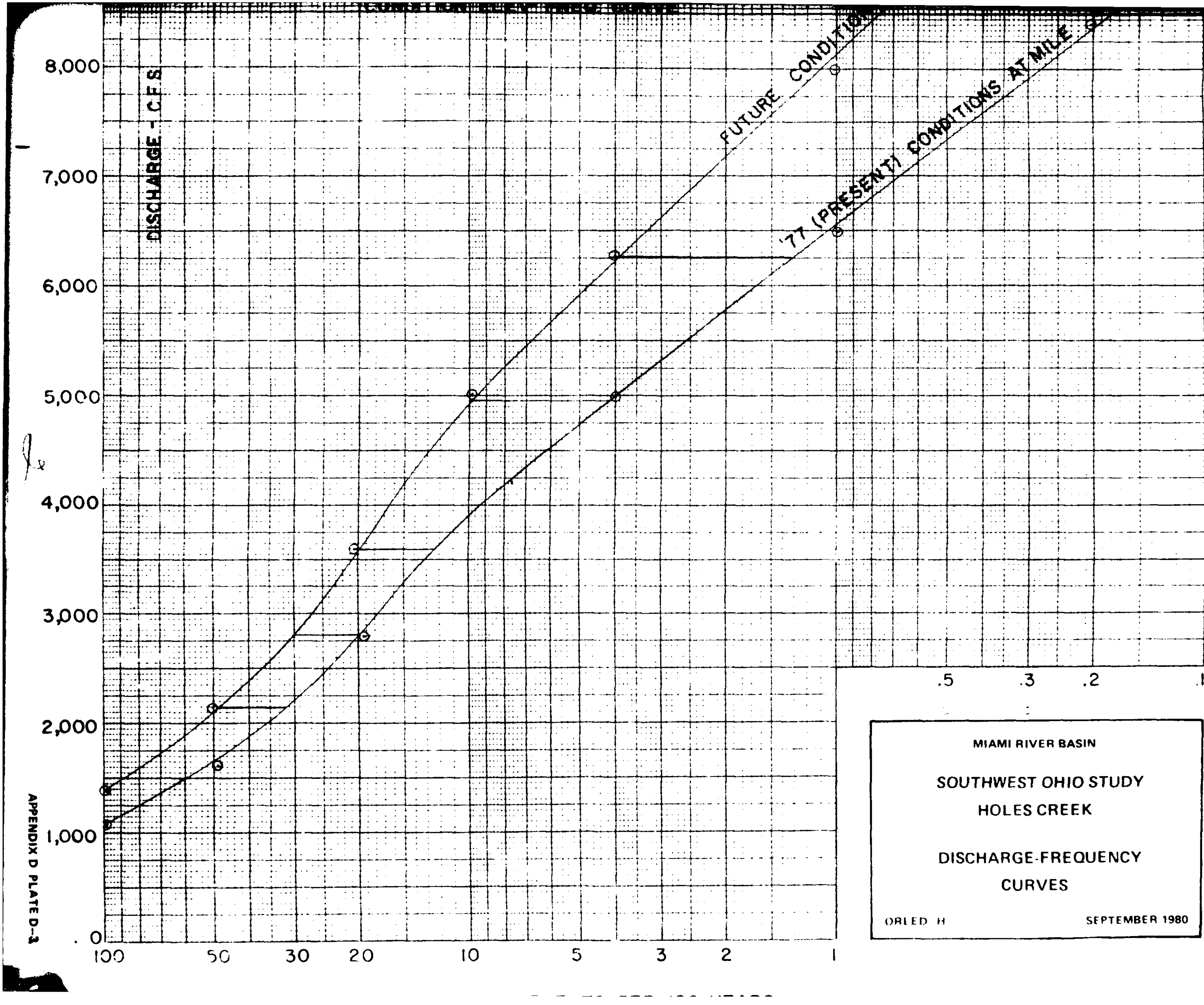
HOLES CREEK

DISCHARGE-FREQUENCY CURVES

ORLED · H SEPTEMBER 1980



13,000
12,000
11,000
10,000
9,000
8,000
- CFS
FOR USE IN DETERMINING FUTURE
CONDITION ELEV- FREQ. CURVE
FUTURE CONDITIONS AT MILE 2.80
CONDITIONS AT MILE 2.80

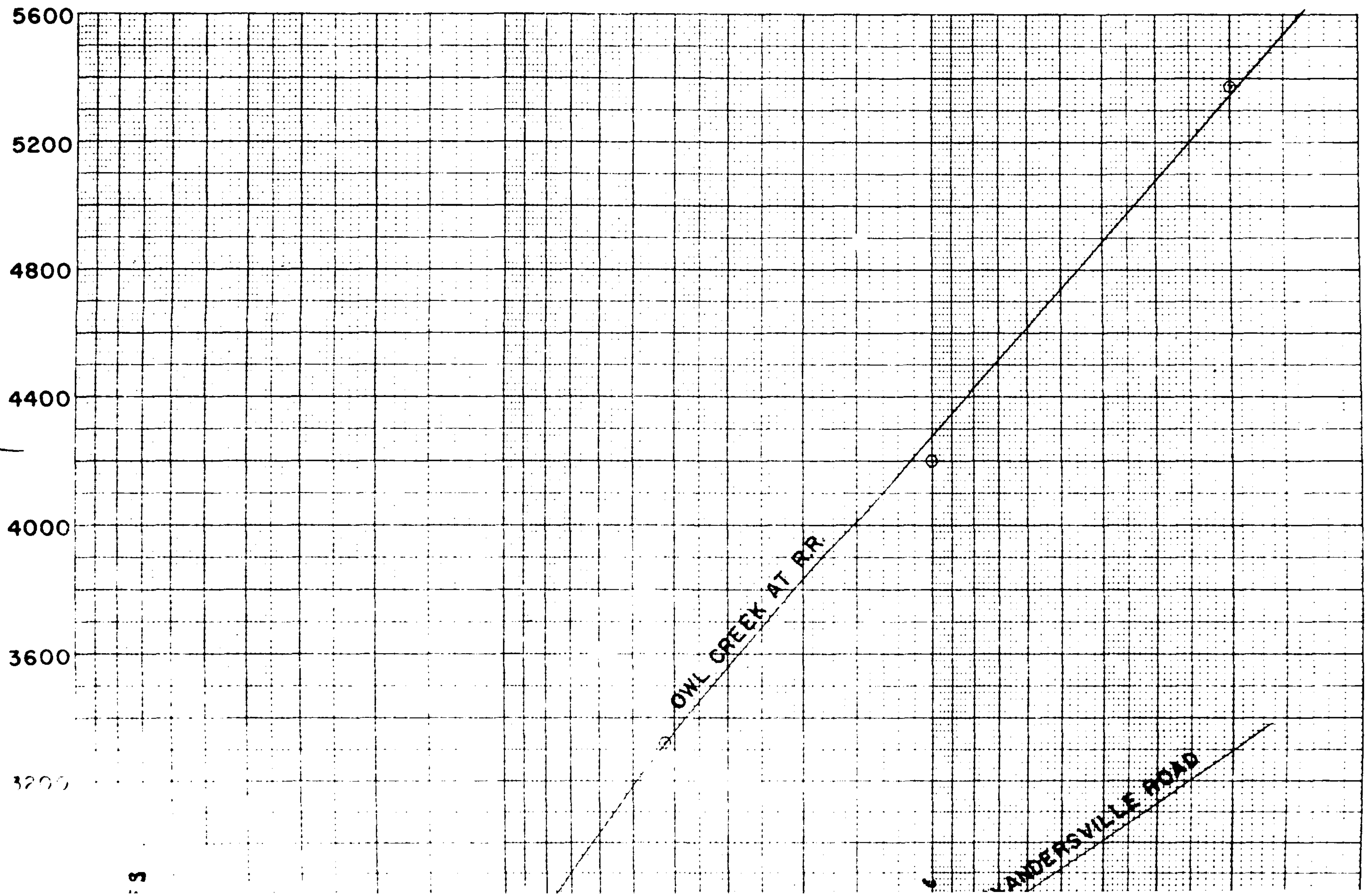


MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY
HOLES CREEK

DISCHARGE-FREQUENCY
CURVES

ORLED H SEPTEMBER 1980


5600
5200
4800
4400
4000
3600
OWL CREEK AT R.R.
ANDERSVILLE ROAD

AD-A113 101 ARMY ENGINEER DISTRICT LOUISVILLE KY F/G 13/2
HOLES CREEK, WATER RESOURCES DEVELOPMENT. VOLUME 2. APPENDICES.(U)
SEP 80

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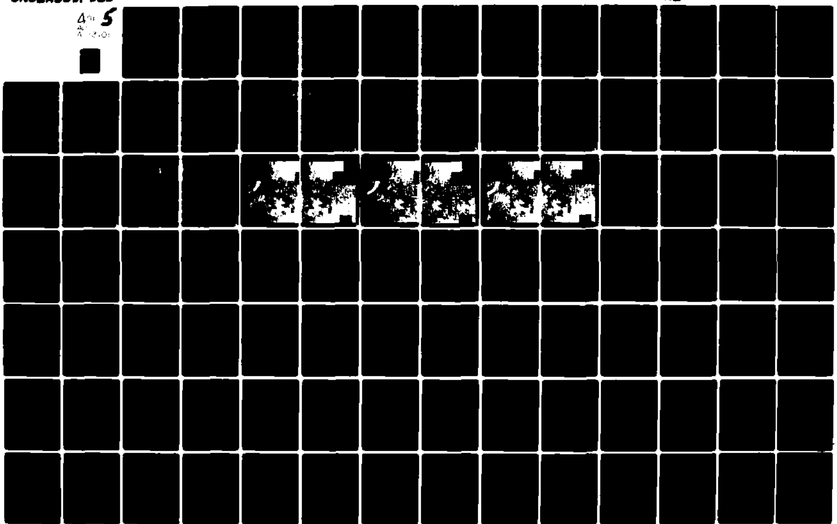
4 of 5



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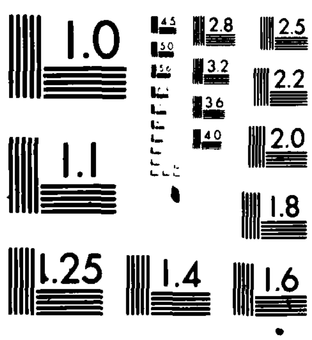
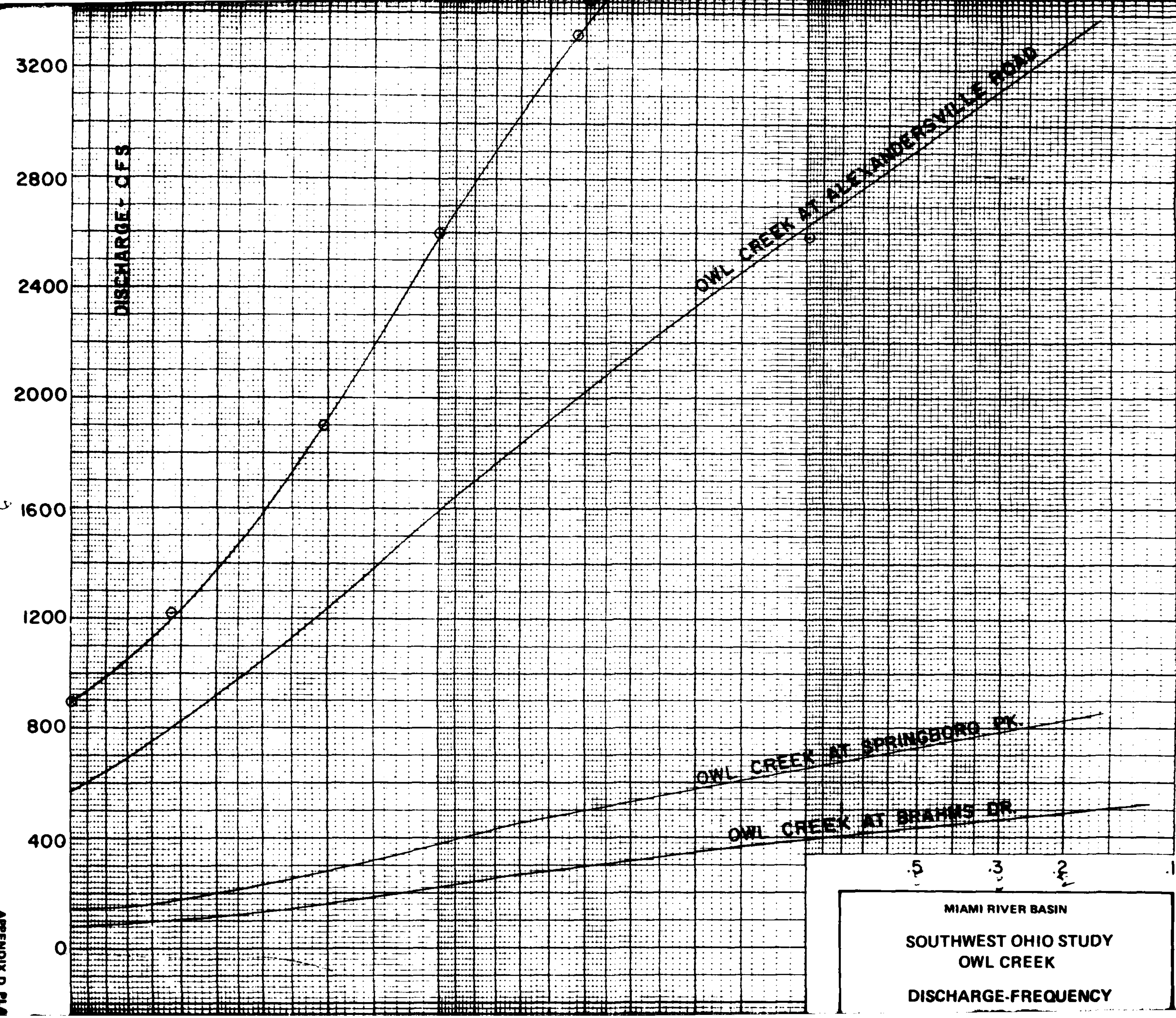


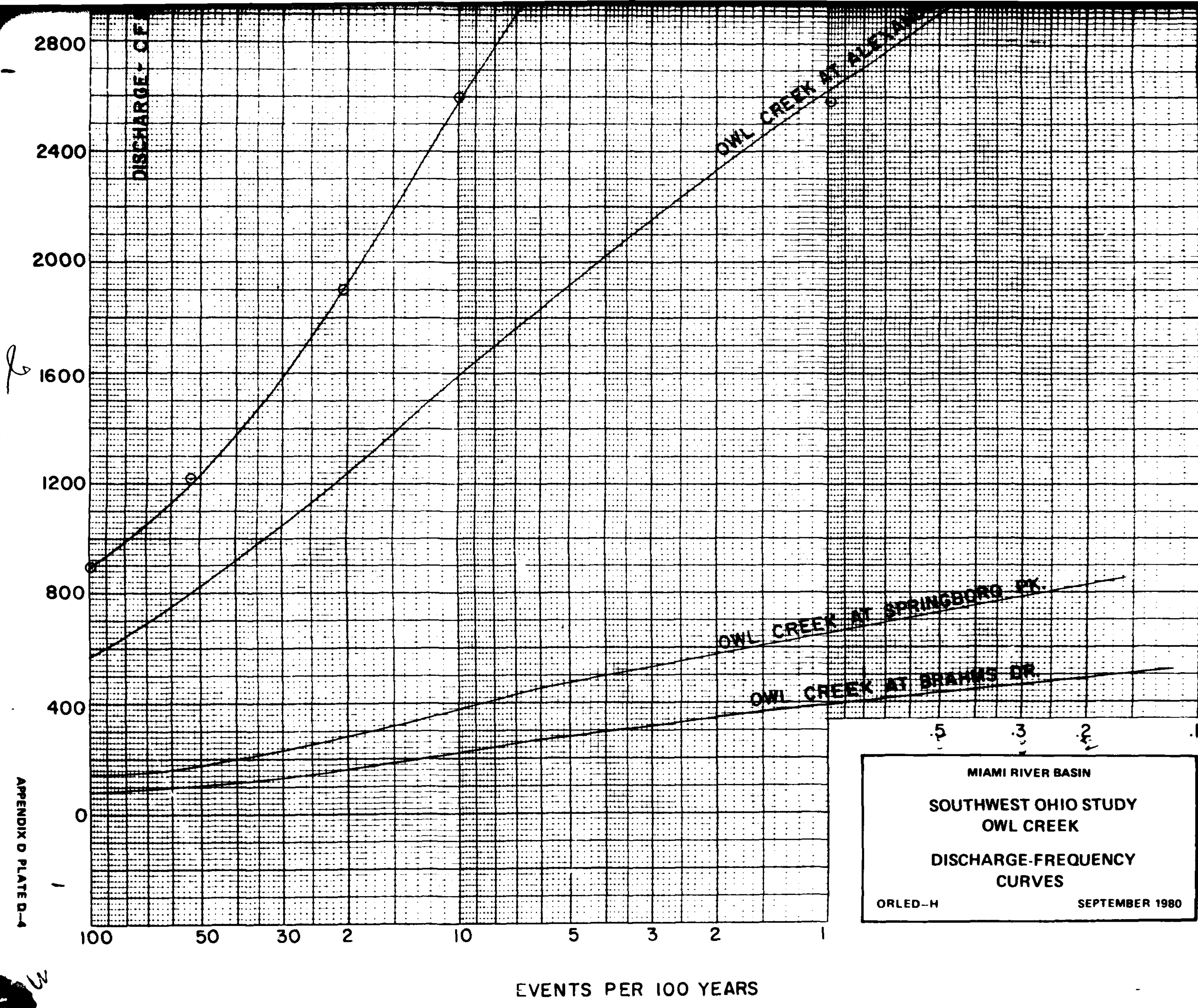
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A



MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY
OWL CREEK

DISCHARGE-FREQUENCY

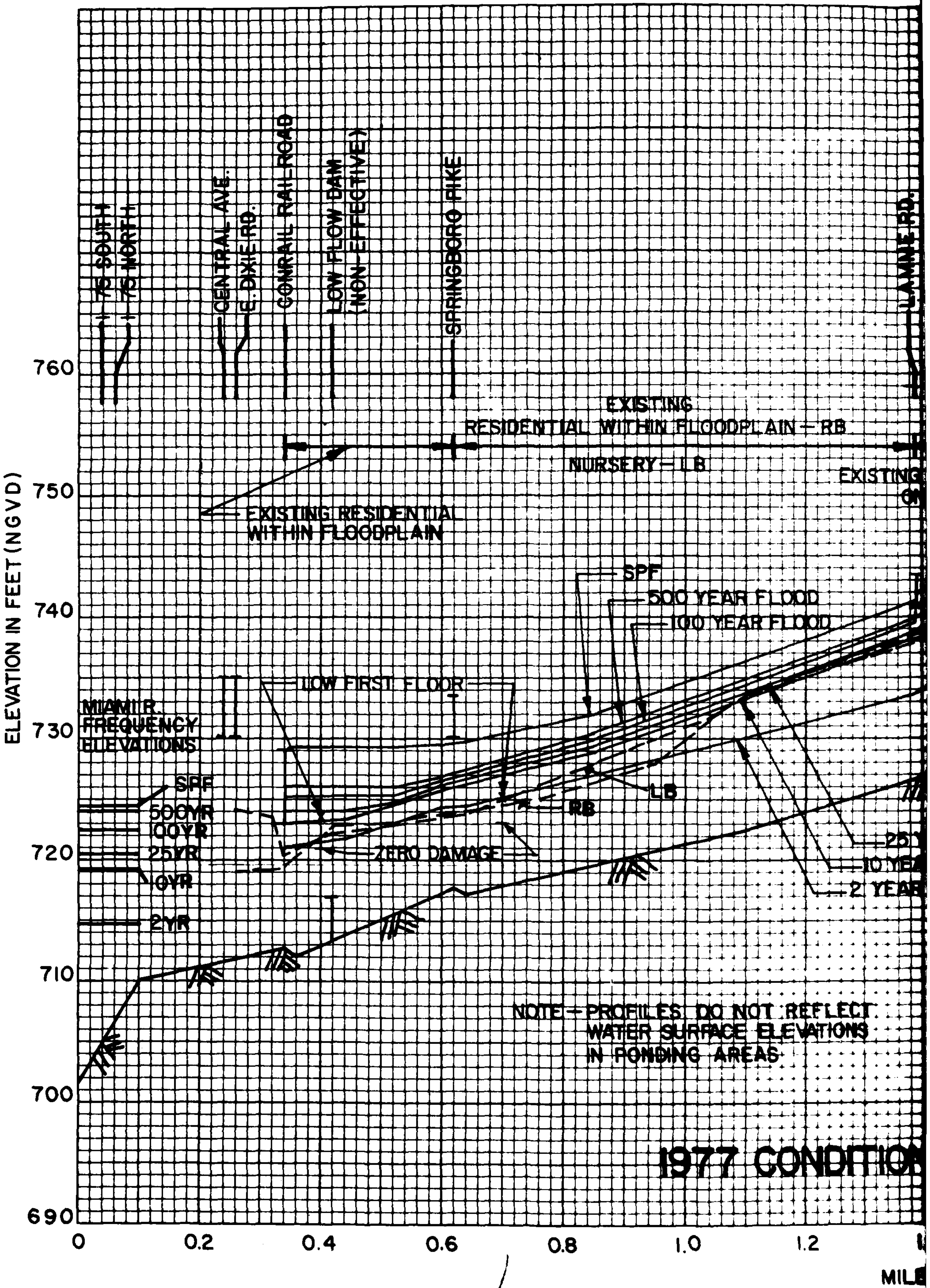


MIAMI RIVER BASIN

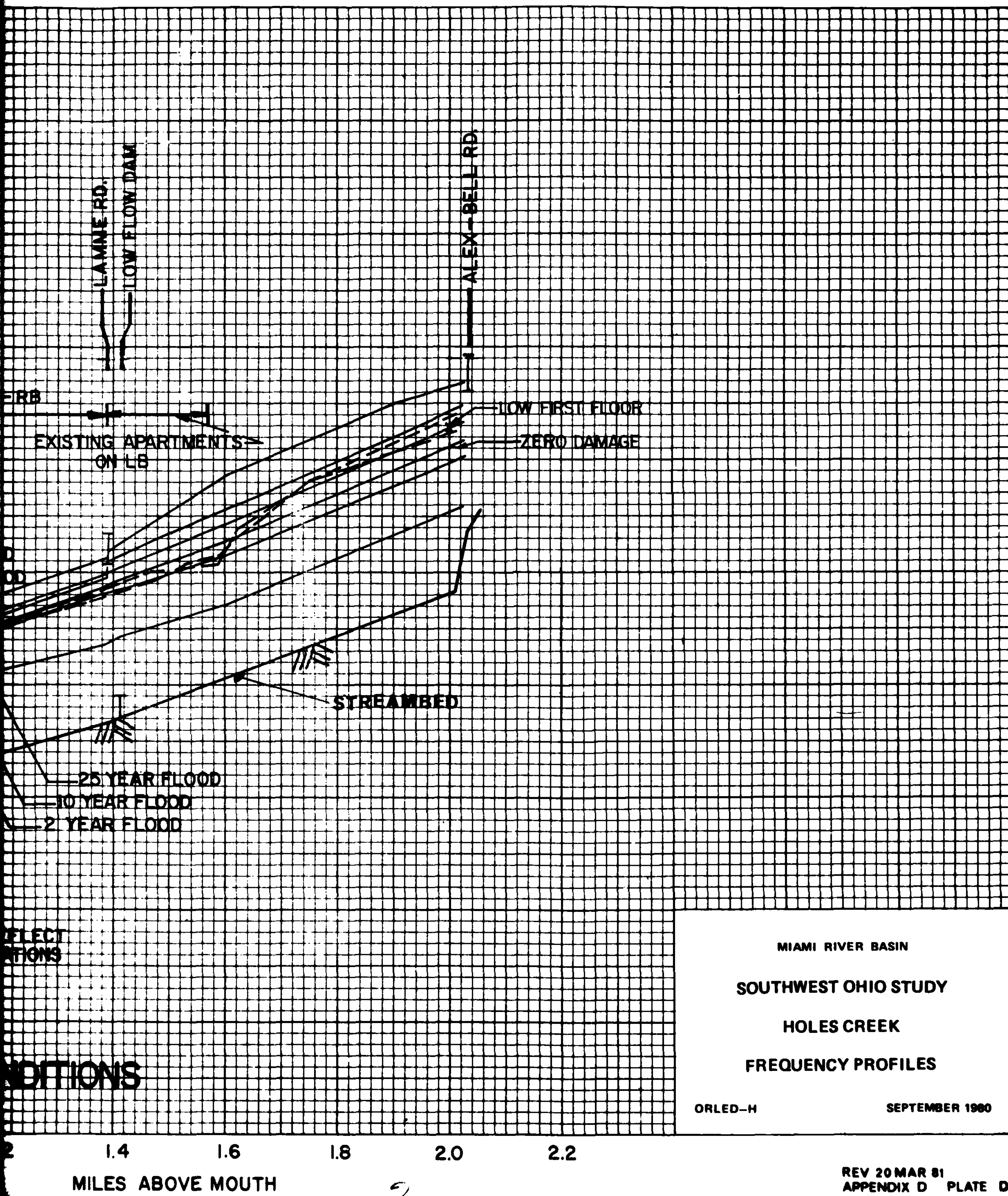
SOUTHWEST OHIO STUDY
OWL CREEK

DISCHARGE-FREQUENCY
CURVES

ORLED-H SEPTEMBER 1980



75 SOUTH
75 NORTH
CENTRAL AVE.
E. DIXIE RD.
CONRAIL RAILROAD
LOW FLOW DAM (NON-EFFECTIVE)
SPRINGBORO PIKE
LAMME RD.
EXISTING RESIDENTIAL WITHIN FLOODPLAIN — RB
NURSERY — LB
EXISTING RESIDENTIAL WITHIN FLOODPLAIN
SPF
500 YEAR FLOOD
100 YEAR FLOOD
LOW FIRST FLOOR
MIAMI R. FREQUENCY ELEVATIONS
SPF
500YR
100YR
25YR
10YR
2YR
LB
RB
ZERO DAMAGE
25 Y
10 YEA
2 YEAR
NOTE — PROFILES DO NOT REFLECT WATER SURFACE ELEVATIONS IN PONDING AREAS
1977 CONDITIO
ELEVATION IN FEET (NGVD)
690
700
710
720
730
740
750
760
0
0.2
0.4
0.6
0.8
1.0
1.2
MILE



MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY

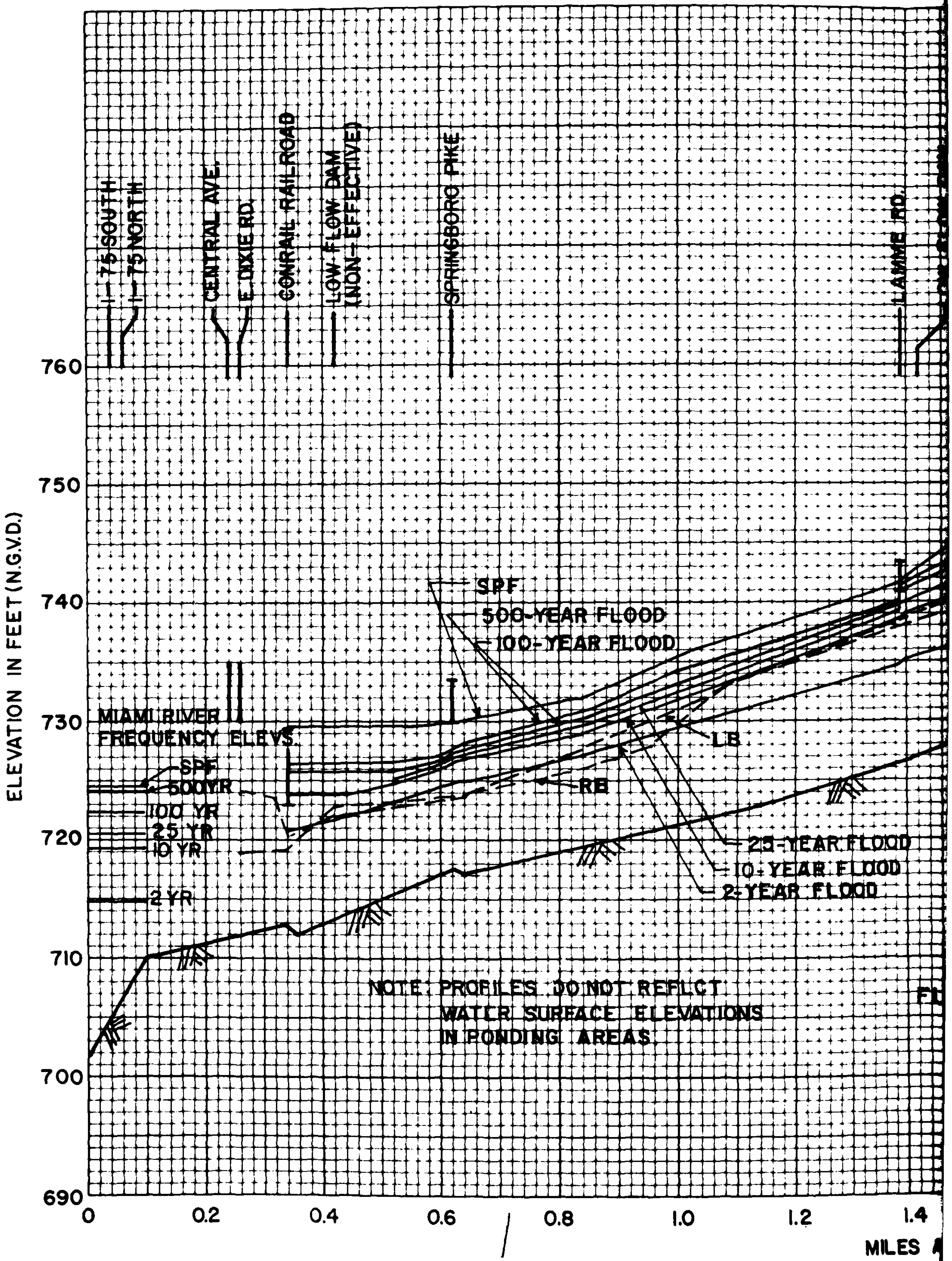
HOLES CREEK

FREQUENCY PROFILES

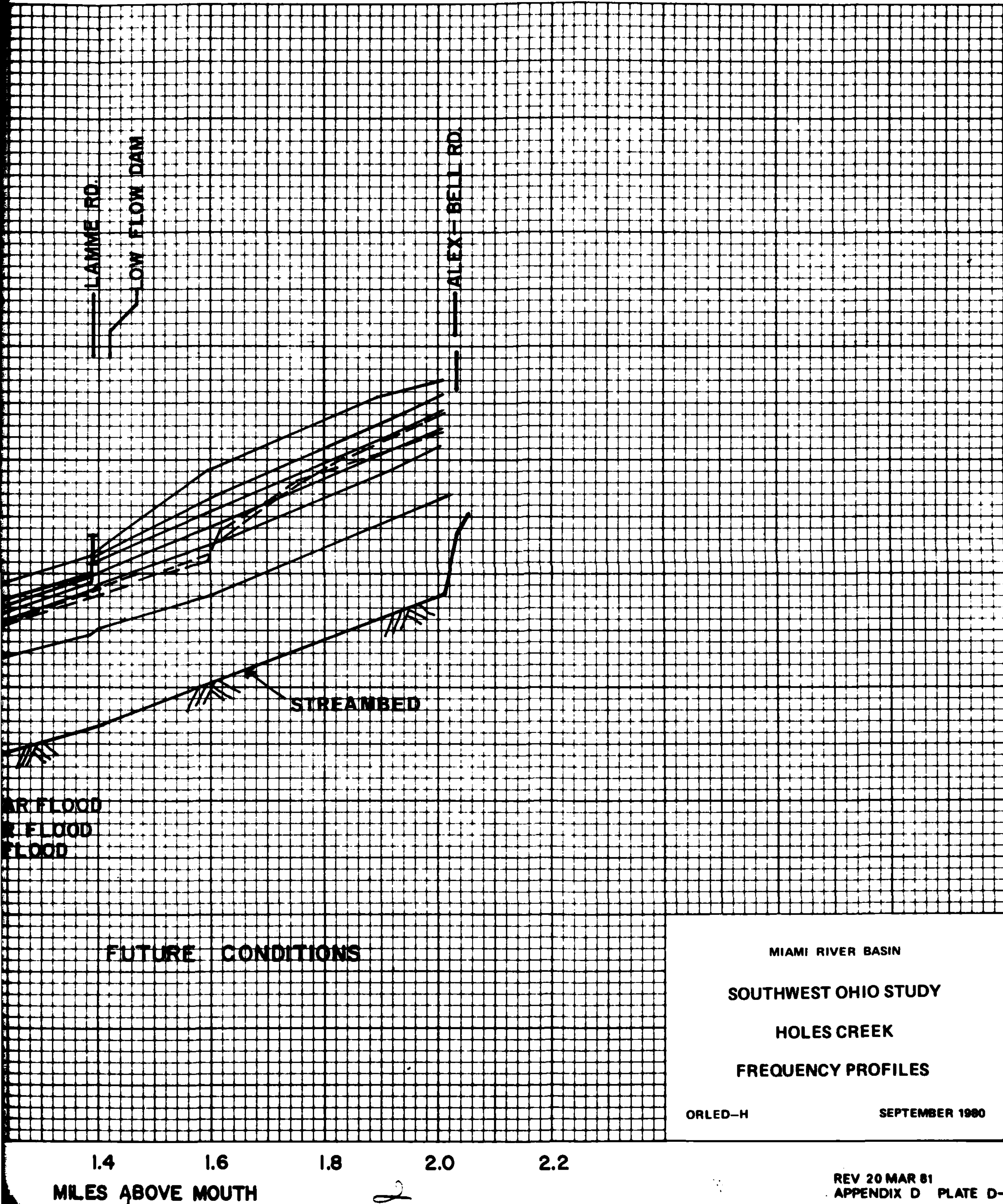
ORLED-H SEPTEMBER 1980

2

REV 20 MAR 81
APPENDIX D PLATE D-



I - 75 SOUTH
I - 75 NORTH
CENTRAL AVE.
E. DIXIE RD.
CONRAIL RAILROAD
LOW FLOW DAM (NON-EFFECTIVE)
SPRINGBORO PIKE
LAMME RD.
ELEVATION IN FEET (N.G.V.D.)
760
750
740
730
720
710
700
690
SPF
500-YEAR FLOOD
100-YEAR FLOOD
MIAMI RIVER FREQUENCY ELEVS.
SPF
500YR
100 YR
25 YR
10 YR
2 YR
LB
RB
25-YEAR FLOOD
10-YEAR FLOOD
2-YEAR FLOOD
NOTE: PROFILES DO NOT REFLCT WATER SURFACE ELEVATIONS IN PONDING AREAS.
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
MILES



MIAMI RIVER BASIN

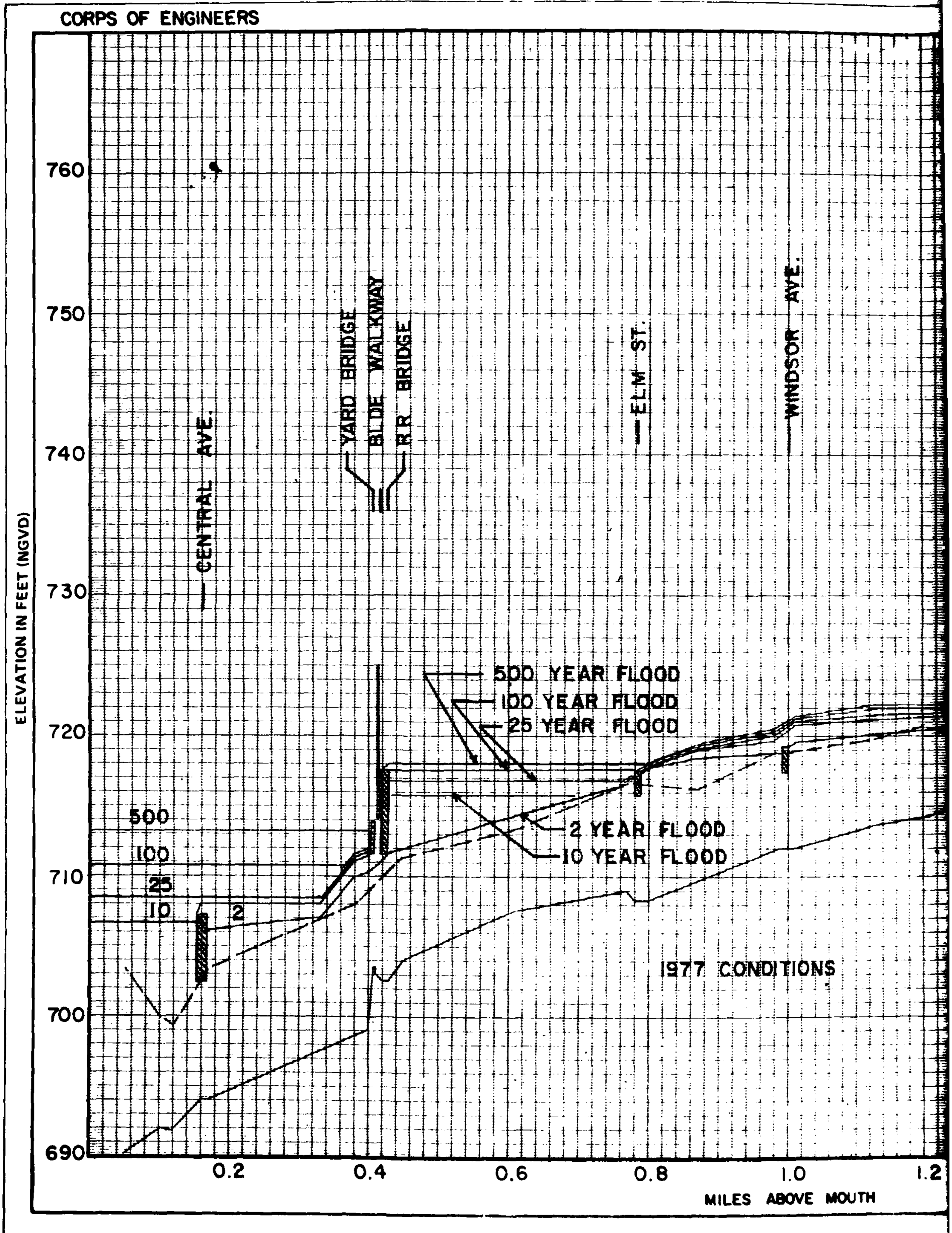
SOUTHWEST OHIO STUDY

HOLES CREEK

FREQUENCY PROFILES

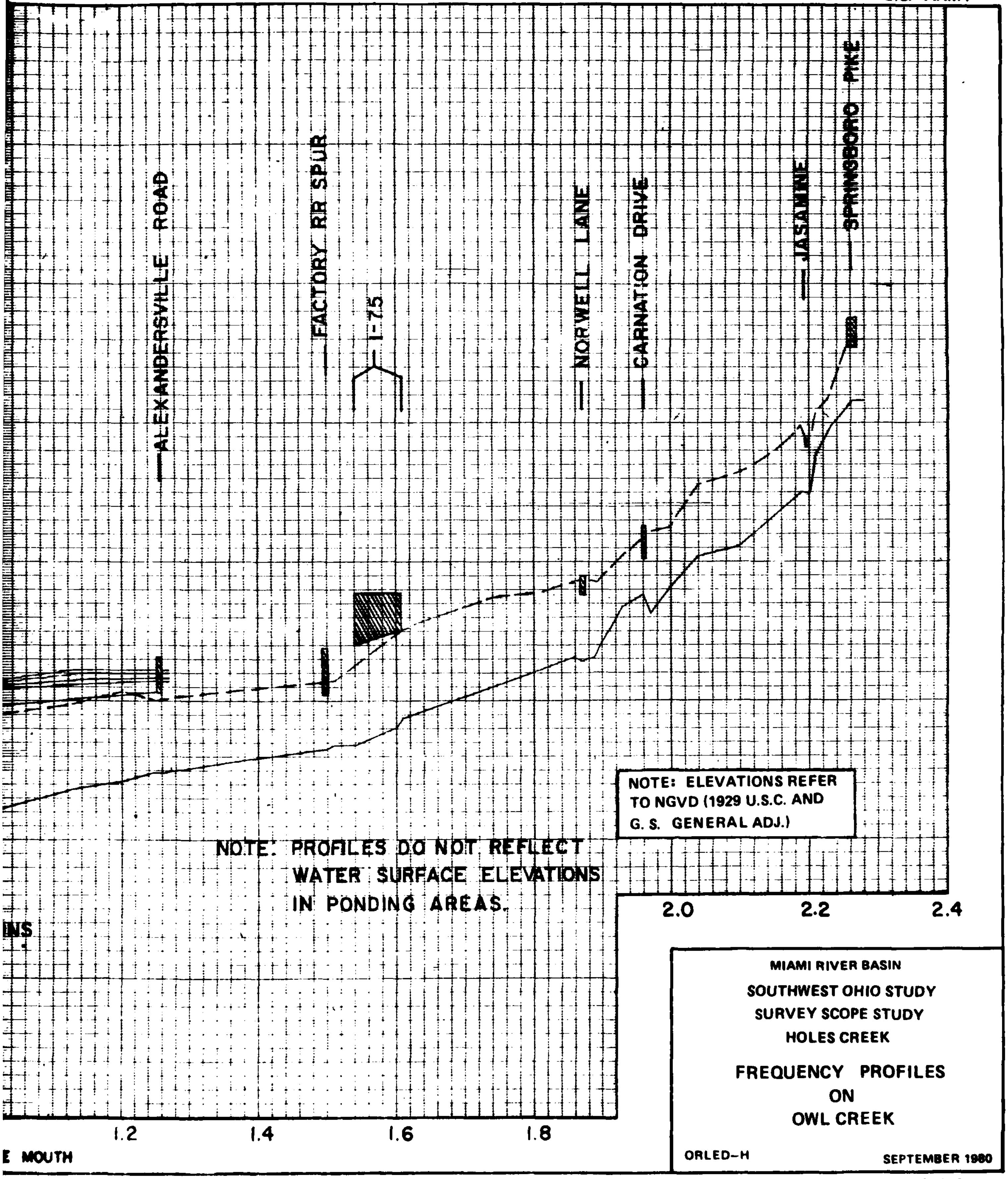
ORLED-H SEPTEMBER 1980

REV 20 MAR 81


CORPS OF ENGINEERS
ELEVATION IN FEET (NGVD)
760
750
740
730
720
710
700
690
CENTRAL AVE.
YARD BRIDGE
BLDE WALKWAY
R.R. BRIDGE
ELM ST.
WINDSOR AVE.
500 YEAR FLOOD
100 YEAR FLOOD
25 YEAR FLOOD
2 YEAR FLOOD
10 YEAR FLOOD
500
100
25
10
2
1977 CONDITIONS
0.2
0.4
0.6
0.8
1.0
1.2
MILES ABOVE MOUTH

1

U.S. ARMY



MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY

SURVEY SCOPE STUDY

HOLES CREEK

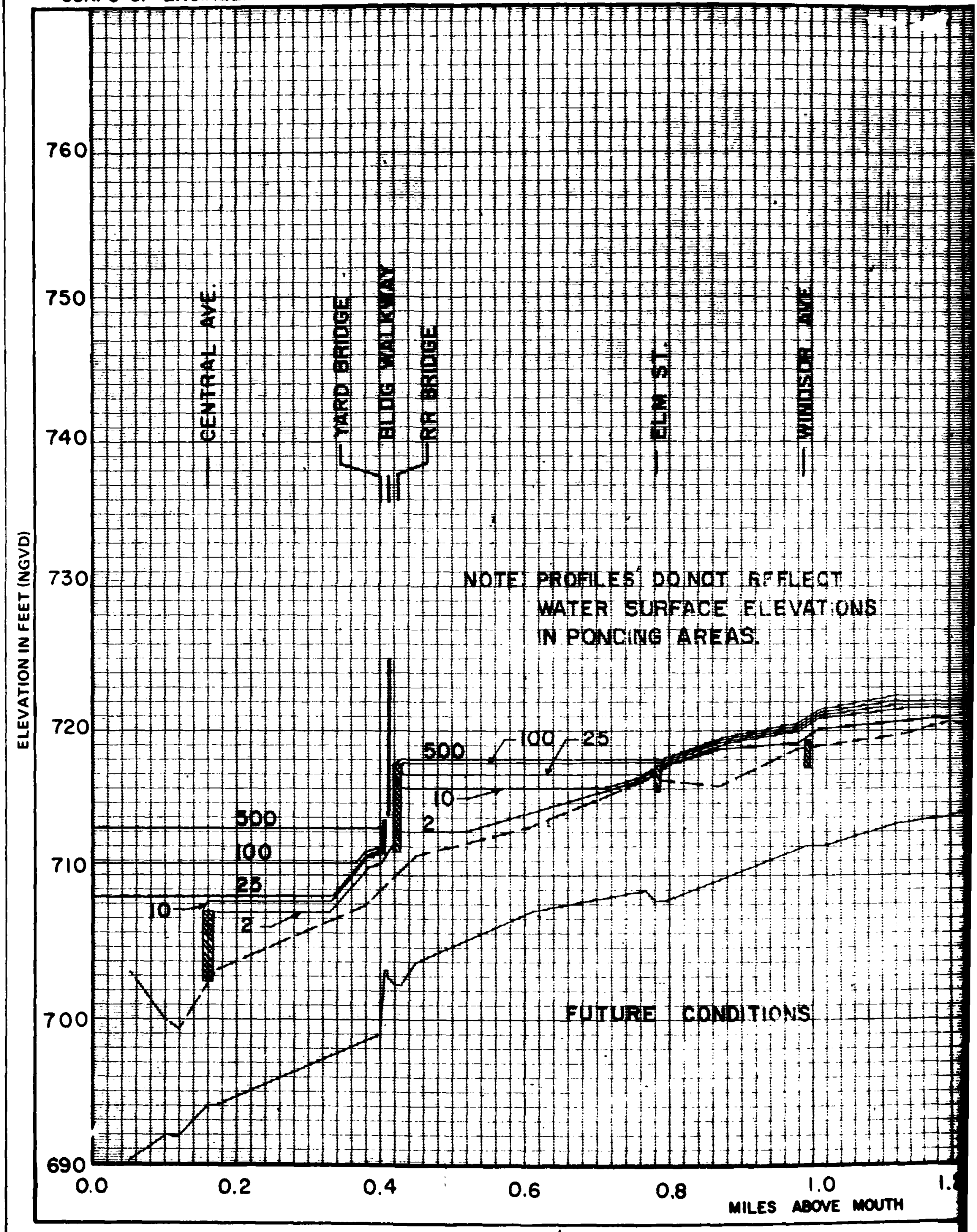
FREQUENCY PROFILES
ON
OWL CREEK

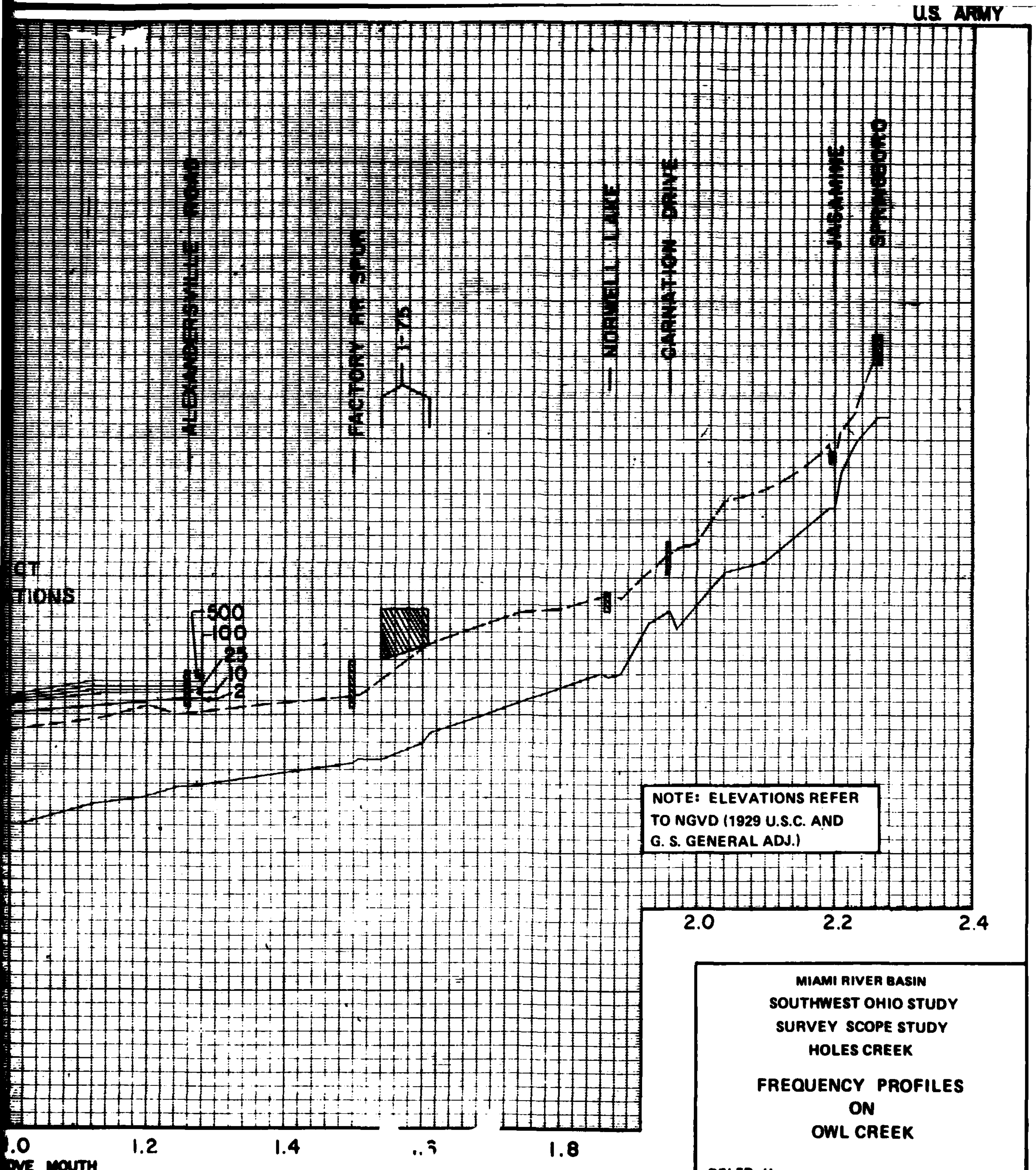
ORLED-H

SEPTEMBER 1980

APPENDIX D PLATE D-7

CORPS OF ENGINEERS



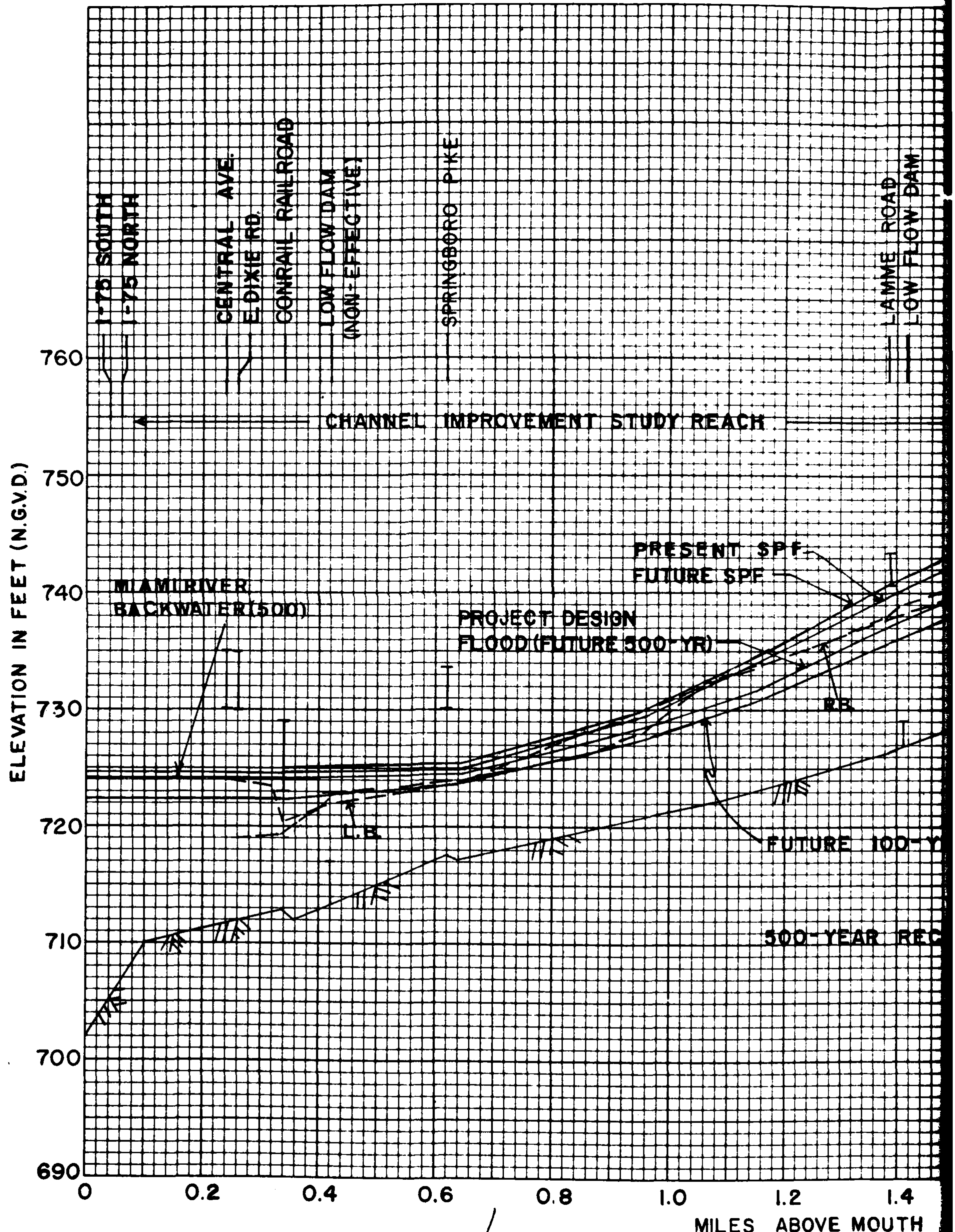


MIAMI RIVER BASIN
SOUTHWEST OHIO STUDY
SURVEY SCOPE STUDY
HOLES CREEK

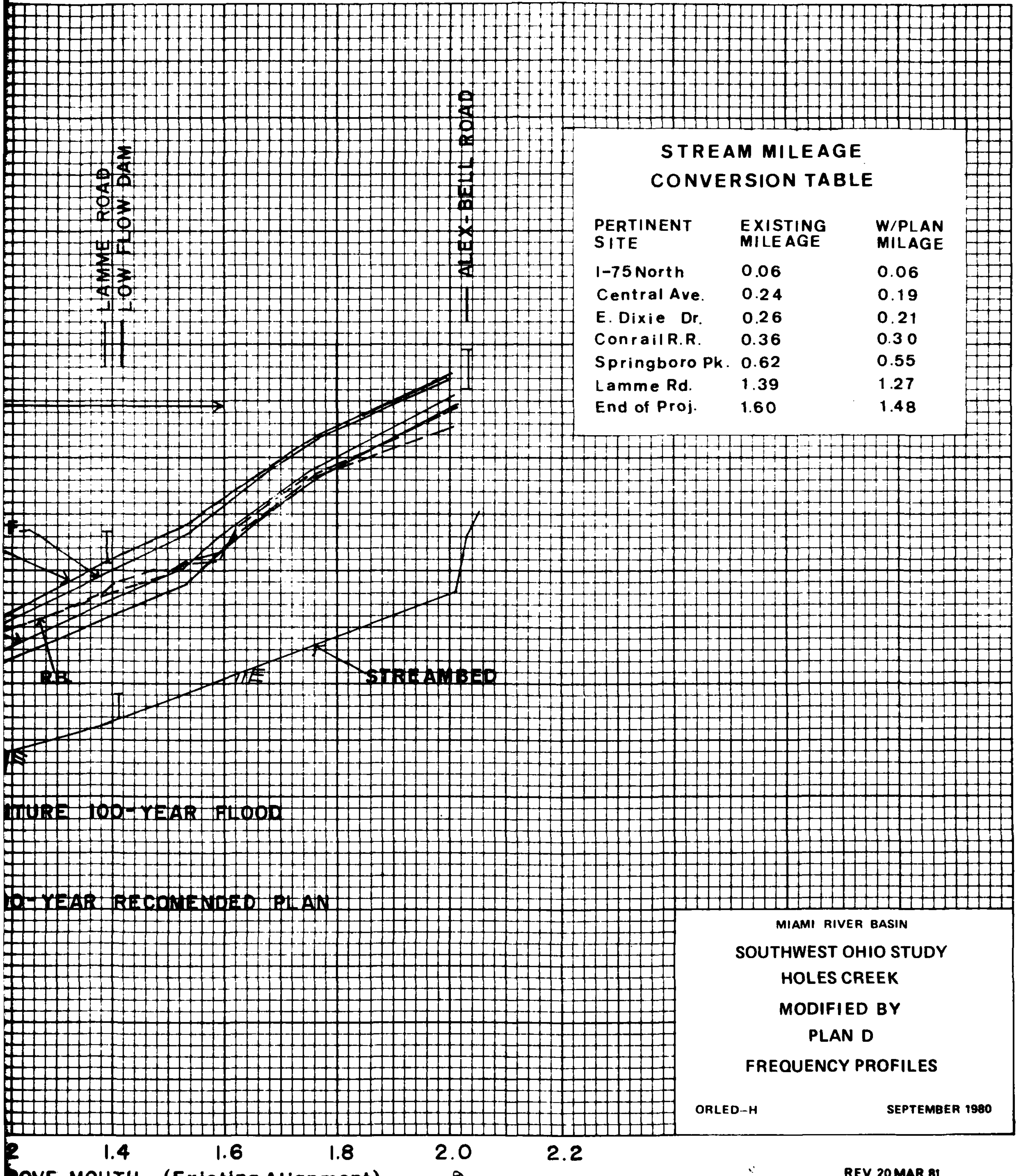
FREQUENCY PROFILES
ON
OWL CREEK

ORLED-H SEPTEMBER 1980

APPENDIX D PLATE D-8



I-75 SOUTH
I-75 NORTH
CENTRAL AVE.
E. DIXIE RD.
CONRAIL RAILROAD
LOW FLOW DAM (NON-EFFECTIVE)
SPRINGBORO PIKE
LAMME ROAD
LOW FLOW DAM
CHANNEL IMPROVEMENT STUDY REACH
PRESENT SPF
FUTURE SPF
MIAMI RIVER BACKWATER (500)
PROJECT DESIGN FLOOD (FUTURE 500-YR)
R.B.
L.B.
FUTURE 100-Y
500-YEAR REC
ELEVATION IN FEET (N.G.V.D.)
760
750
740
730
720
710
700
690
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
MILES ABOVE MOUTH



STREAM MILEAGE CONVERSION TABLE

PERTINENT SITE	EXISTING MILEAGE	W/PLAN MILAGE
I-75 North	0.06	0.06
Central Ave.	0.24	0.19
E. Dixie Dr.	0.26	0.21
Conrail R.R.	0.36	0.30
Springboro Pk.	0.62	0.55
Lamme Rd.	1.39	1.27
End of Proj.	1.60	1.48

MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY

HOLES CREEK

MODIFIED BY

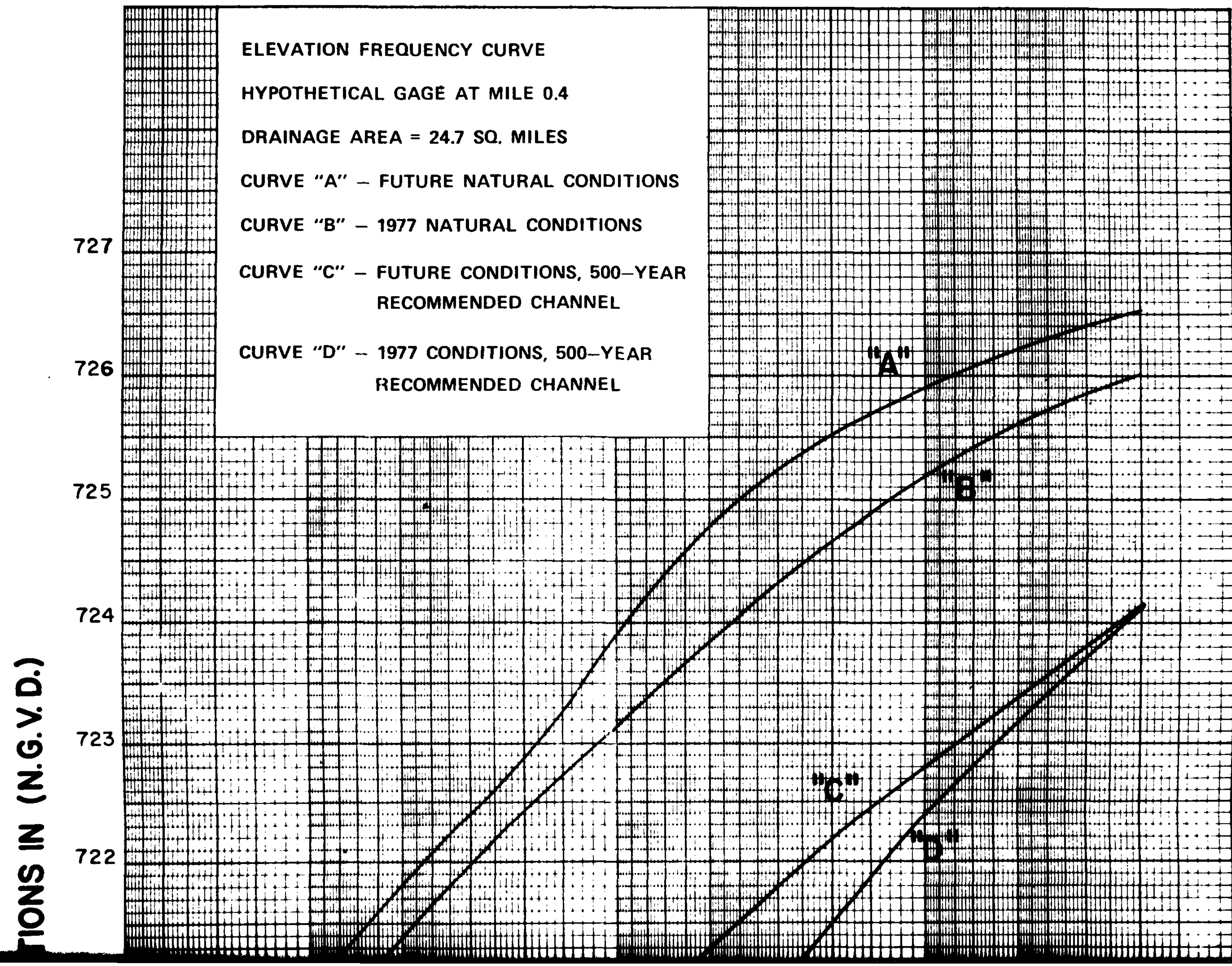
PLAN D

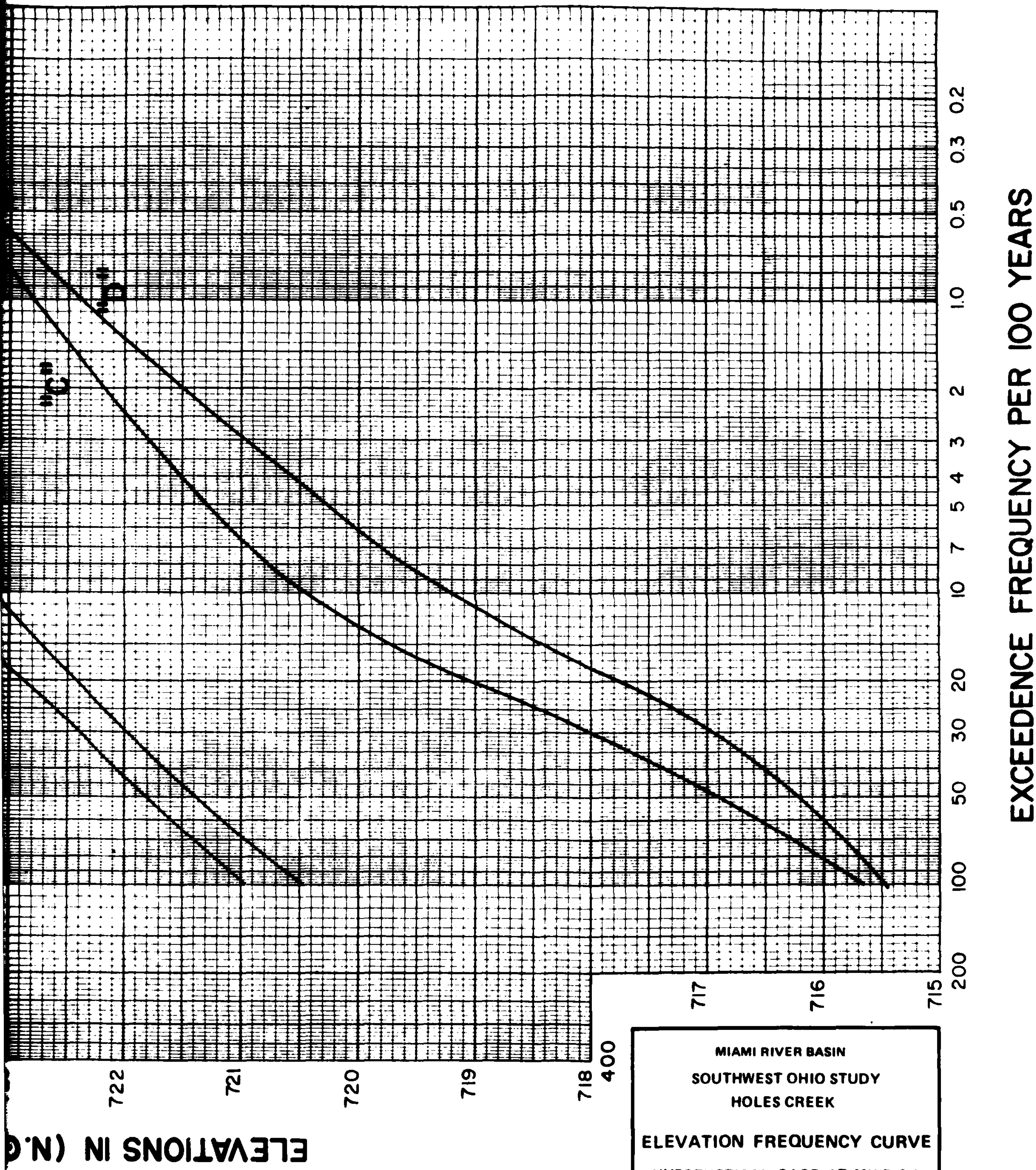
FREQUENCY PROFILES

ORLED-H SEPTEMBER 1980

2

REV 20 MAR 81
APPENDIX D PLATE D-


ELEVATION FREQUENCY CURVE
HYPOTHETICAL GAGE AT MILE 0.4
DRAINAGE AREA = 24.7 SQ. MILES
CURVE "A" – FUTURE NATURAL CONDITIONS
CURVE "B" – 1977 NATURAL CONDITIONS
CURVE "C" – FUTURE CONDITIONS, 500–YEAR RECOMMENDED CHANNEL
CURVE "D" – 1977 CONDITIONS, 500–YEAR RECOMMENDED CHANNEL
"A"
"B"
"C"
"D"
727
726
725
724
723
722
TIONS IN (N.G.V.D.)



MIAMI RIVER BASIN

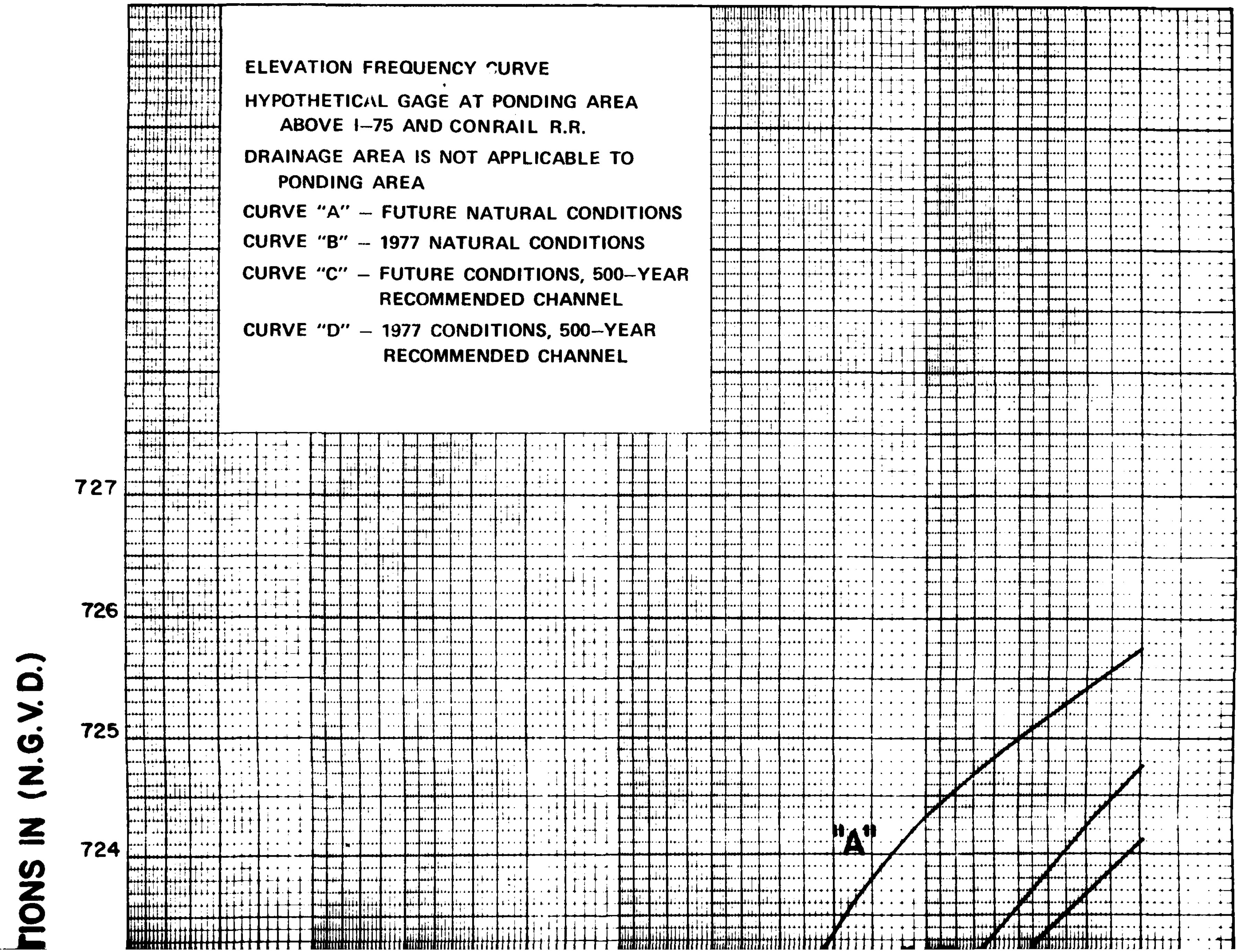
SOUTHWEST OHIO STUDY

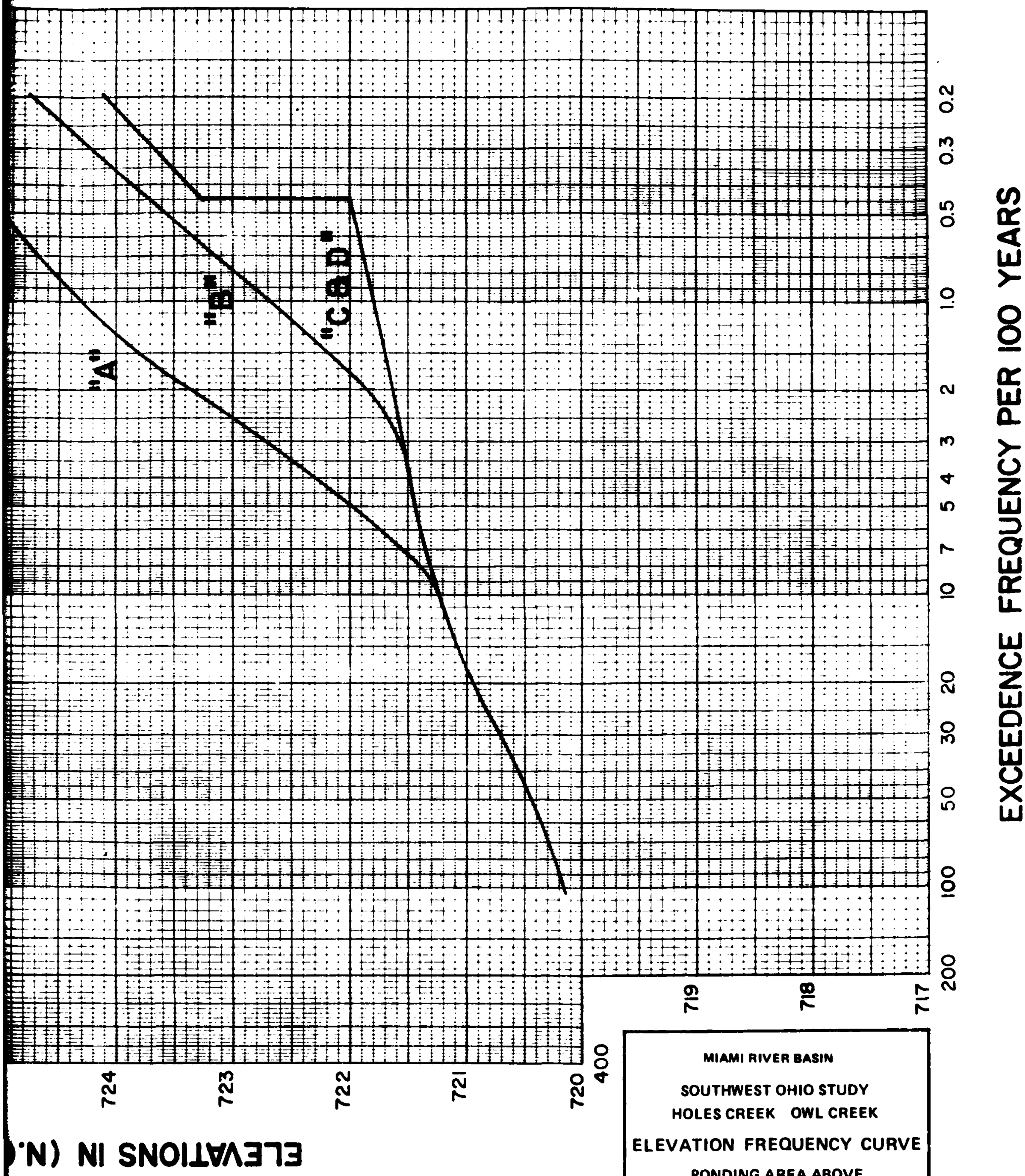
HOLES CREEK

ELEVATION FREQUENCY CURVE

HYPOTHETICAL GAGE AT MILE 0.4

ORLED-H SEPTEMBER 1980


ELEVATION FREQUENCY CURVE
HYPOTHETICAL GAGE AT PONDING AREA ABOVE I–75 AND CONRAIL R.R.
DRAINAGE AREA IS NOT APPLICABLE TO PONDING AREA
CURVE "A" – FUTURE NATURAL CONDITIONS
CURVE "B" – 1977 NATURAL CONDITIONS
CURVE "C" – FUTURE CONDITIONS, 500–YEAR RECOMMENDED CHANNEL
CURVE "D" – 1977 CONDITIONS, 500–YEAR RECOMMENDED CHANNEL
727
726
725
724
"A"
TIONS IN (N.G.V.D.)



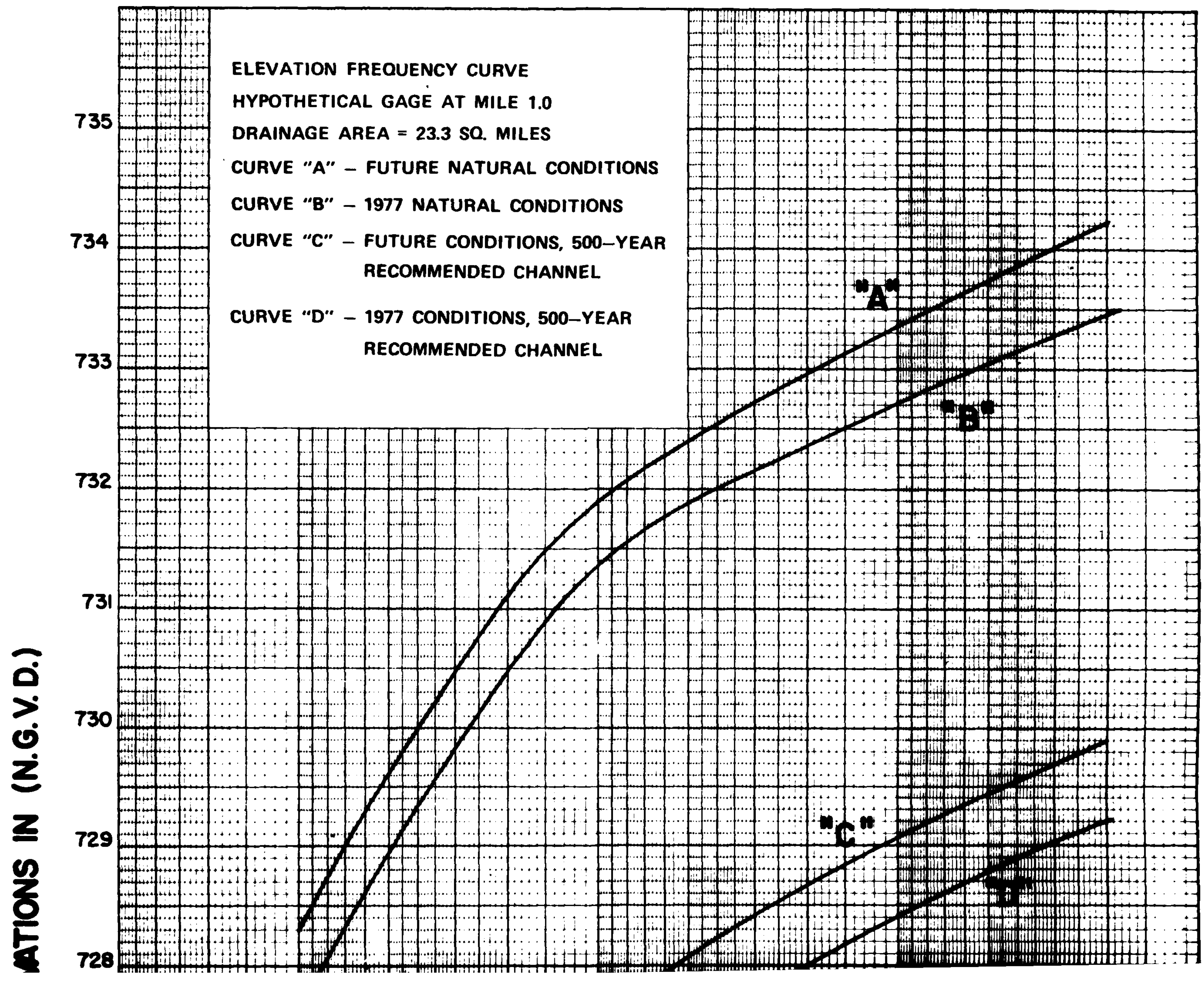
MIAMI RIVER BASIN

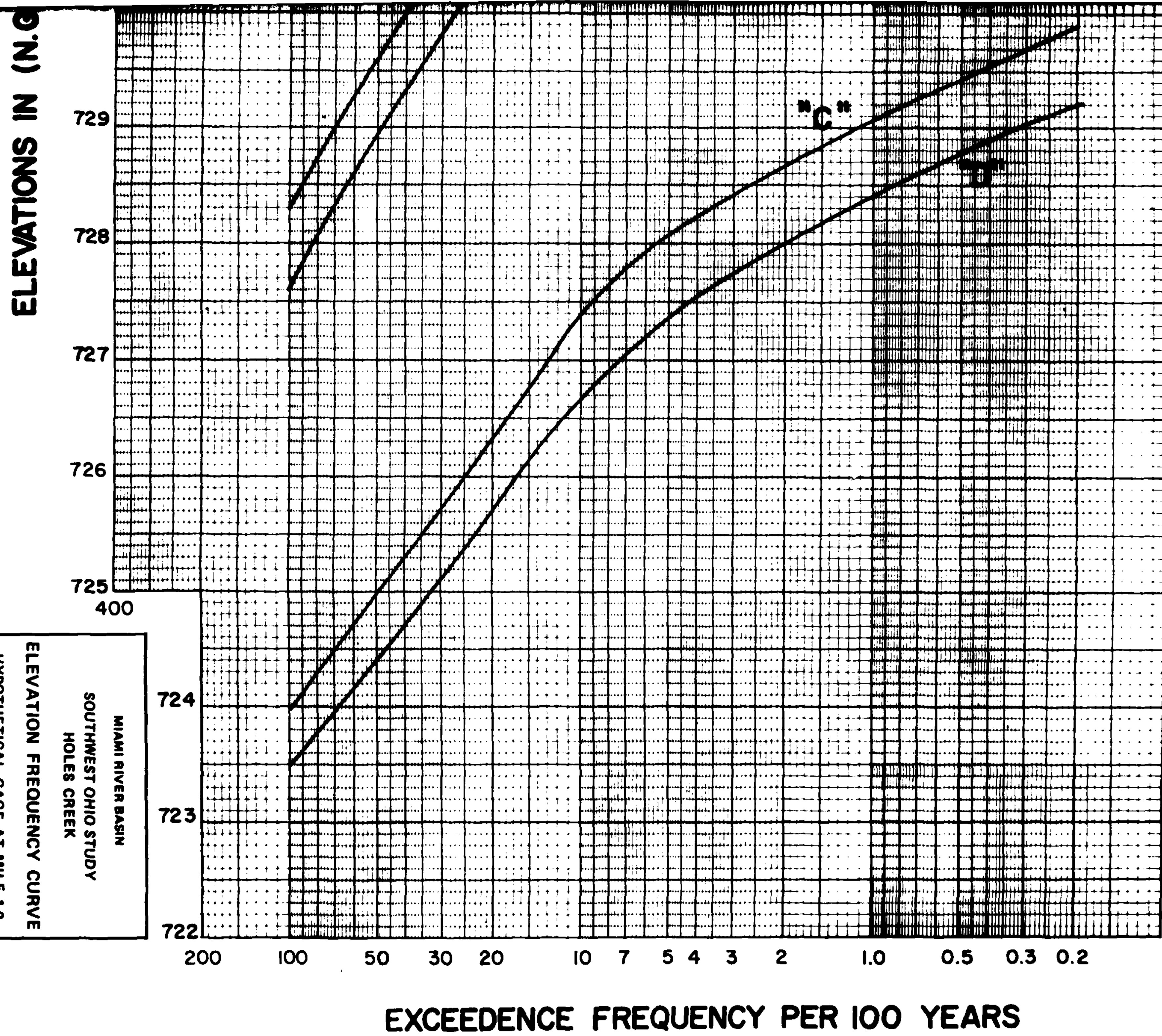
SOUTHWEST OHIO STUDY
HOLES CREEK OWL CREEK

ELEVATION FREQUENCY CURVE

PONDING AREA ABOVE
I-75 & CONRAIL R.R.

ORLED-H SEPTEMBER 1980


ELEVATION FREQUENCY CURVE
HYPOTHETICAL GAGE AT MILE 1.0
DRAINAGE AREA = 23.3 SQ. MILES
CURVE "A" – FUTURE NATURAL CONDITIONS
CURVE "B" – 1977 NATURAL CONDITIONS
CURVE "C" – FUTURE CONDITIONS, 500–YEAR RECOMMENDED CHANNEL
CURVE "D" – 1977 CONDITIONS, 500–YEAR RECOMMENDED CHANNEL
"A"
"B"
"C"
"D"
735
734
733
732
731
730
729
728
ATIONS IN (N.G.V.D.)



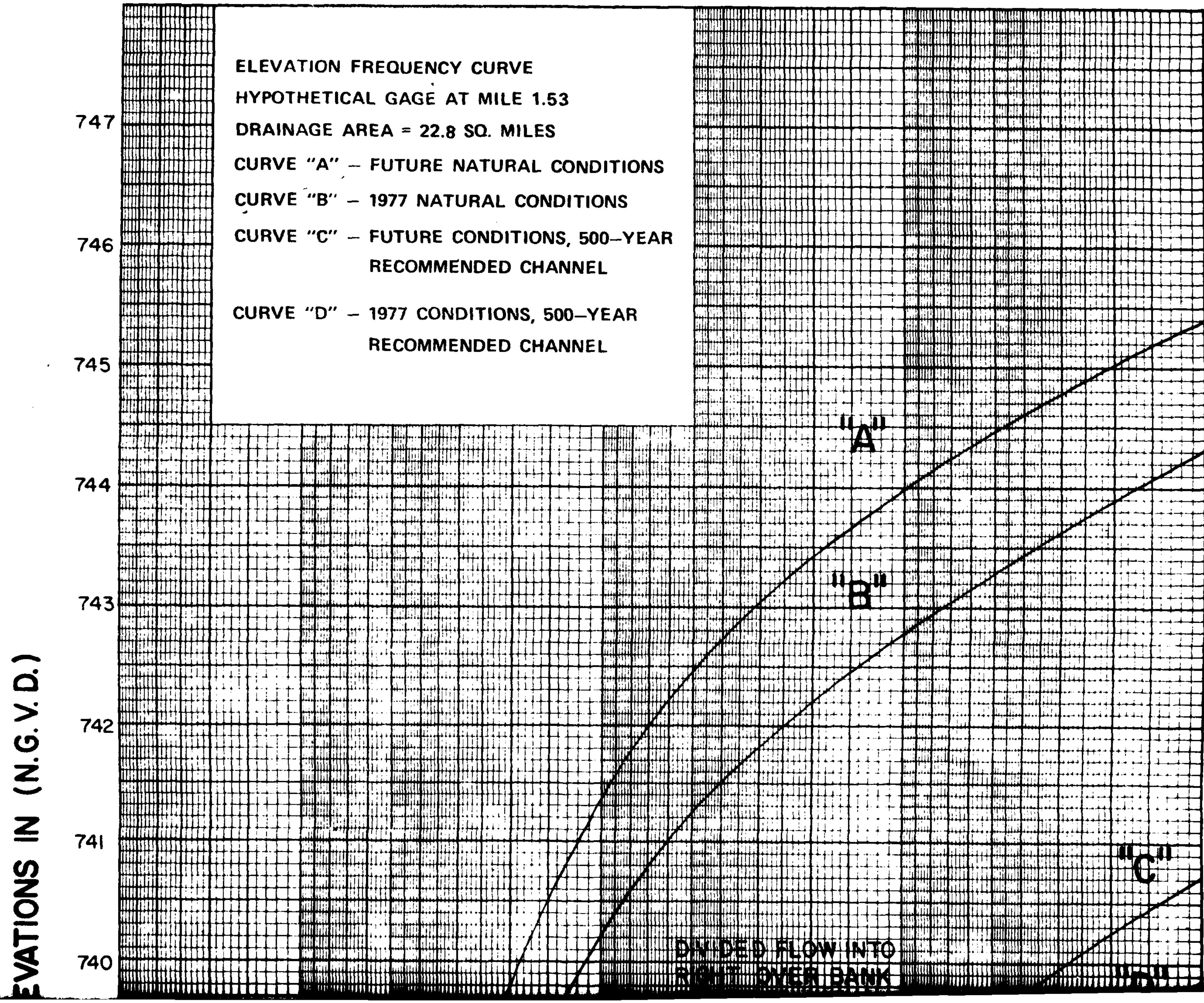
MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY
HOLES CREEK

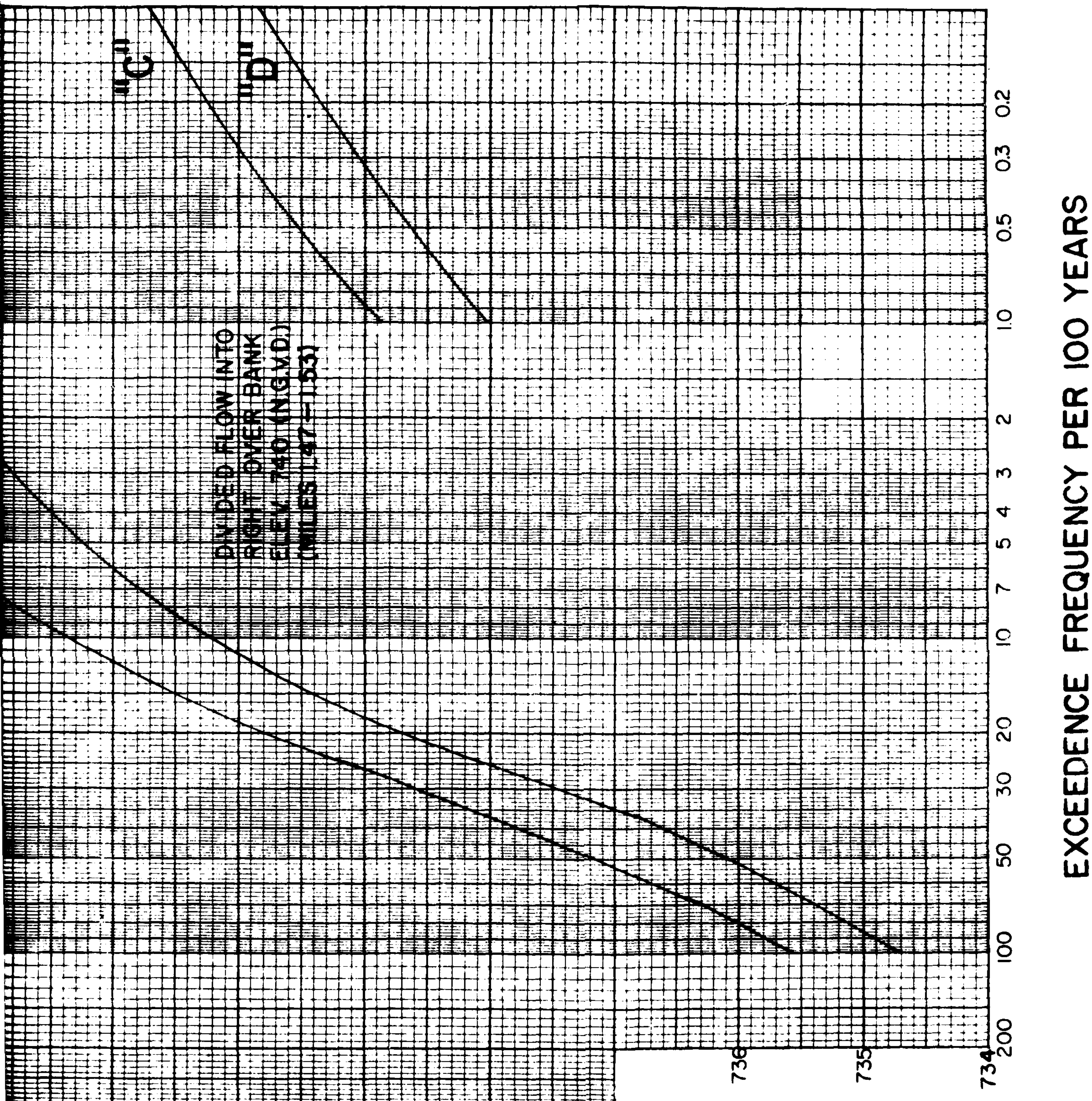
ELEVATION FREQUENCY CURVE

HYPOTHETICAL GAGE AT MILE 1.0

ORLED-H SEPTEMBER 1980



ELEVATION FREQUENCY CURVE
HYPOTHETICAL GAGE AT MILE 1.53
DRAINAGE AREA = 22.8 SQ. MILES
CURVE "A" – FUTURE NATURAL CONDITIONS
CURVE "B" – 1977 NATURAL CONDITIONS
CURVE "C" – FUTURE CONDITIONS, 500–YEAR RECOMMENDED CHANNEL
CURVE "D" – 1977 CONDITIONS, 500–YEAR RECOMMENDED CHANNEL
"A"
"B"
"C"
DIVIDED FLOW INTO
RIGHT OVER BANK
747
746
745
744
743
742
741
740
EVATIONS IN (N.G.V.D.)



MIAMI RIVER BASIN

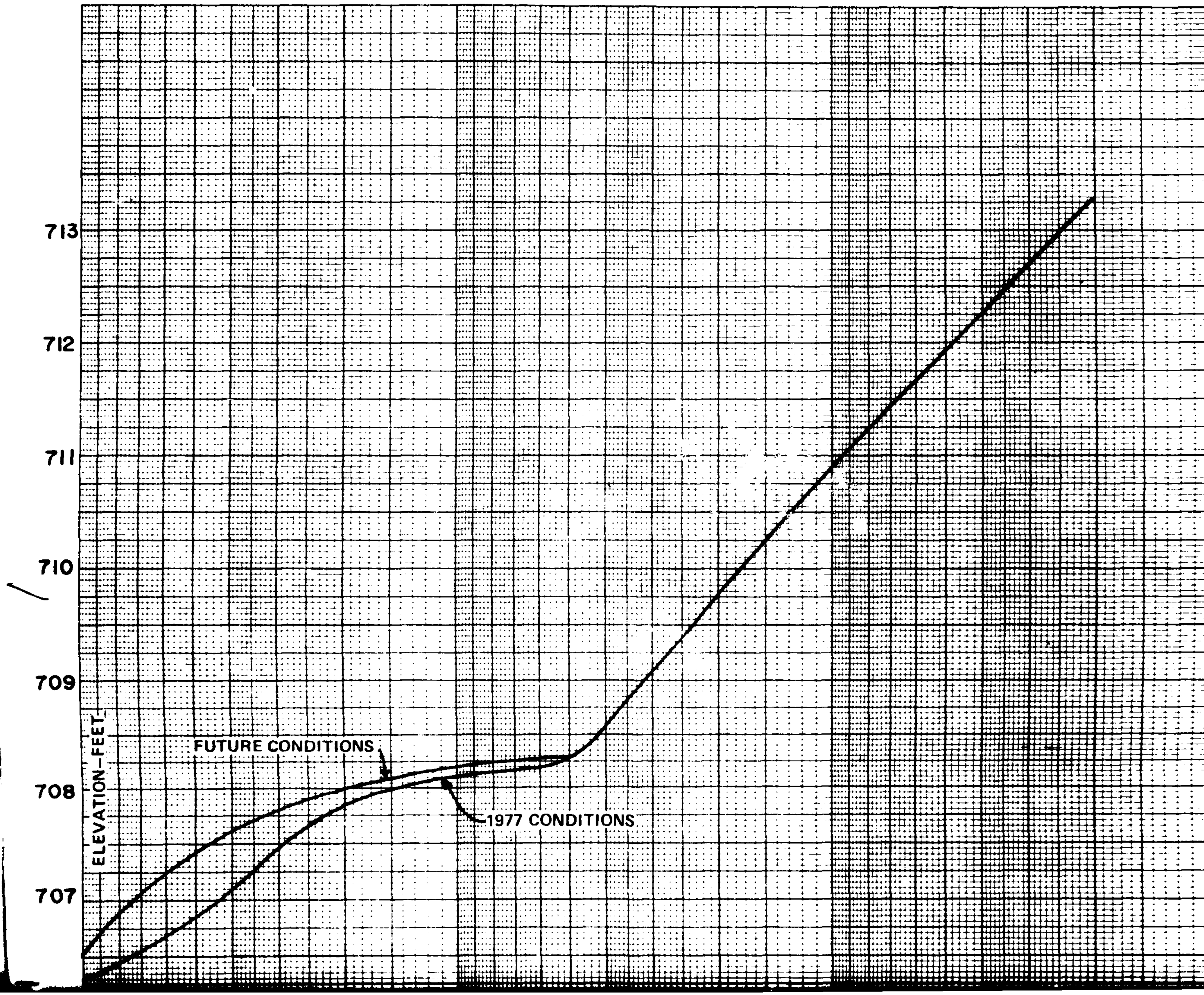
SOUTHWEST OHIO STUDY
HOLES CREEK

ELEVATION FREQUENCY CURVE

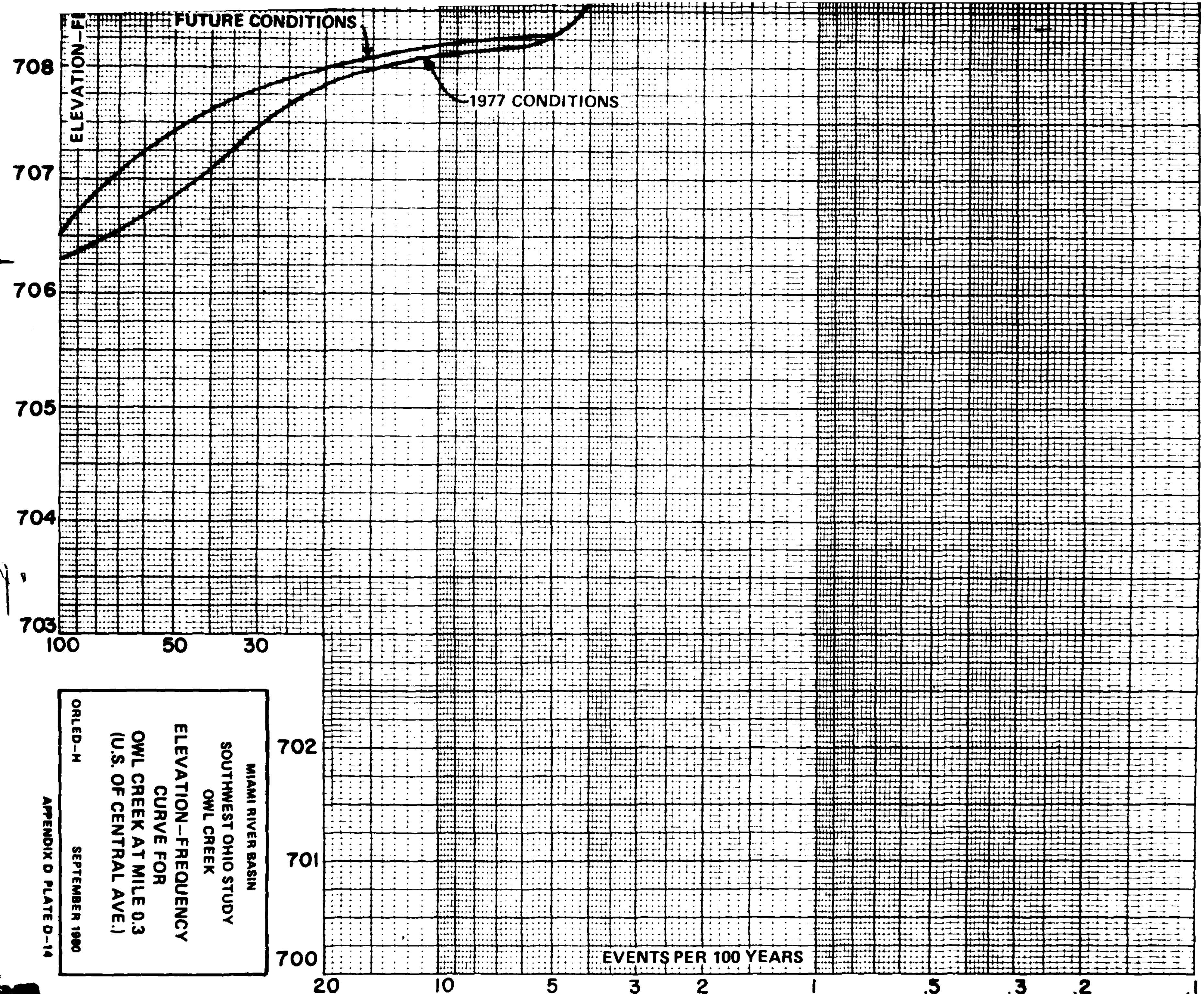
HYPOTHETICAL GAGE AT MILE 1.53

ORLED-H SEPTEMBER 1980

APPENDIX D PLATE D-13



713
712
711
710
709
708
707
ELEVATION–FEET
FUTURE CONDITIONS
1977 CONDITIONS



MIAMI RIVER BASIN

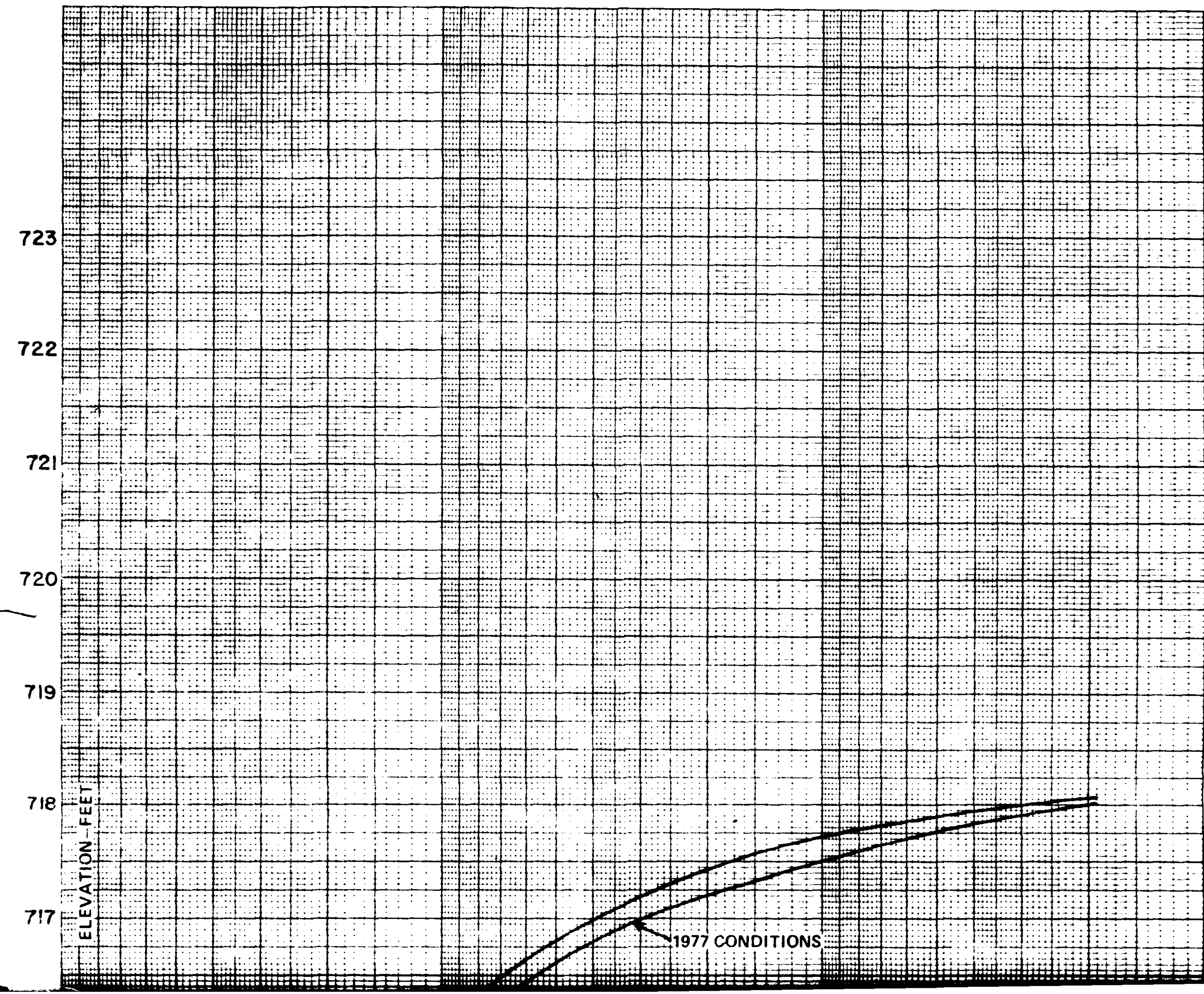
SOUTHWEST OHIO STUDY

OWL CREEK

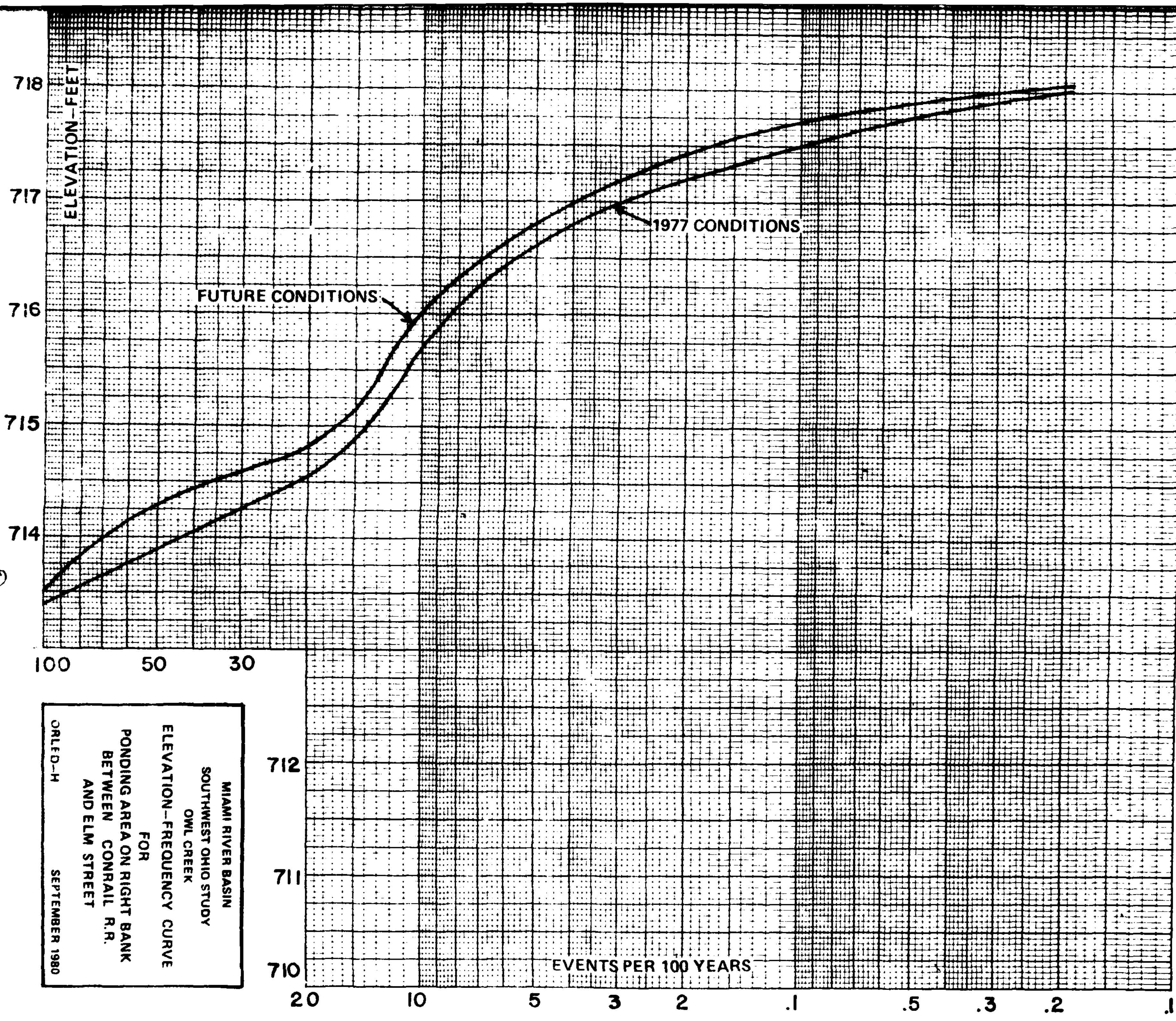
ELEVATION–FREQUENCY CURVE FOR OWL CREEK AT MILE 0.3 (U.S. OF CENTRAL AVE.)

ORLED–H SEPTEMBER 1980

APPENDIX D PLATE D–14



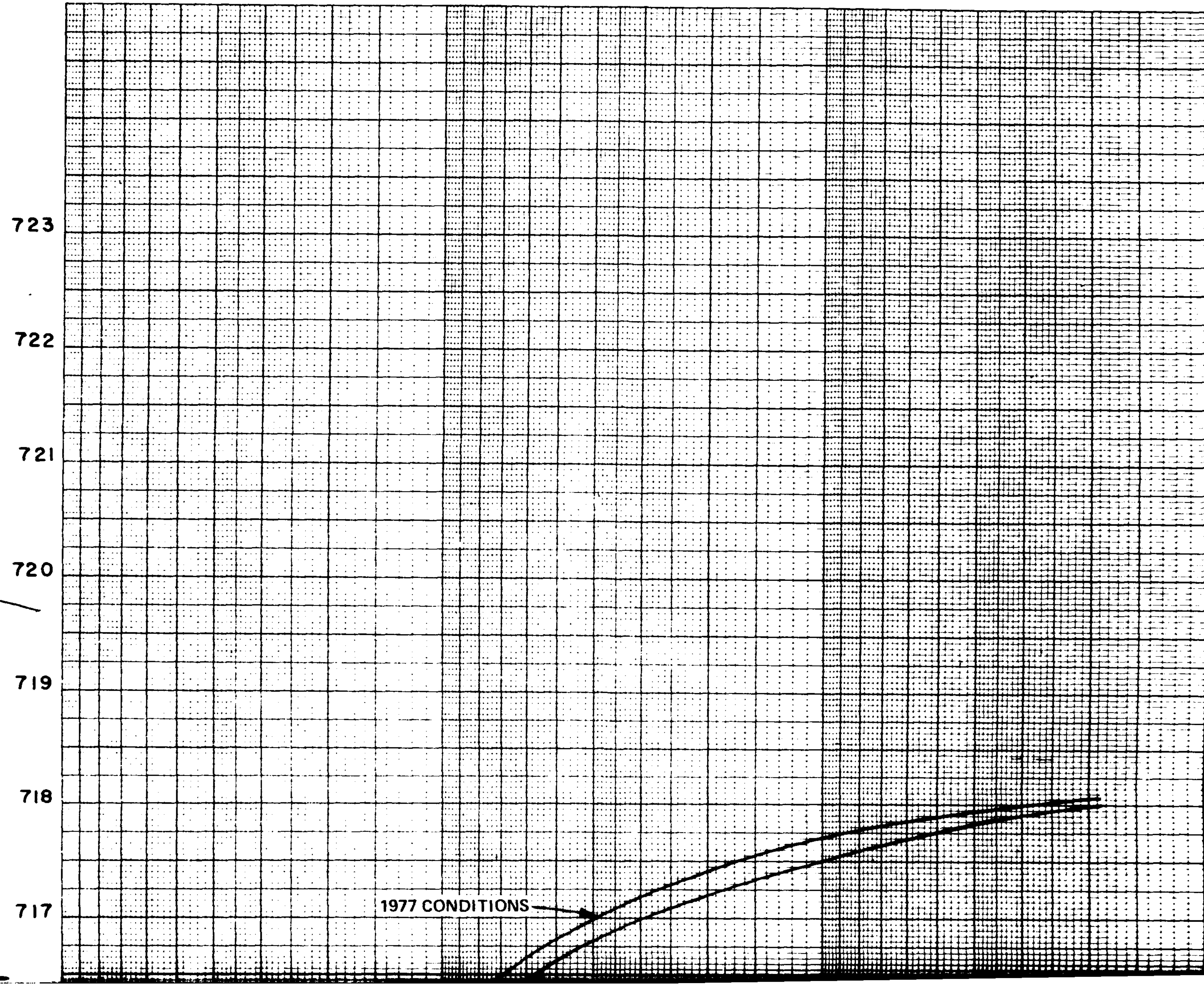
723
722
721
720
719
718
717
ELEVATION–FEET
1977 CONDITIONS



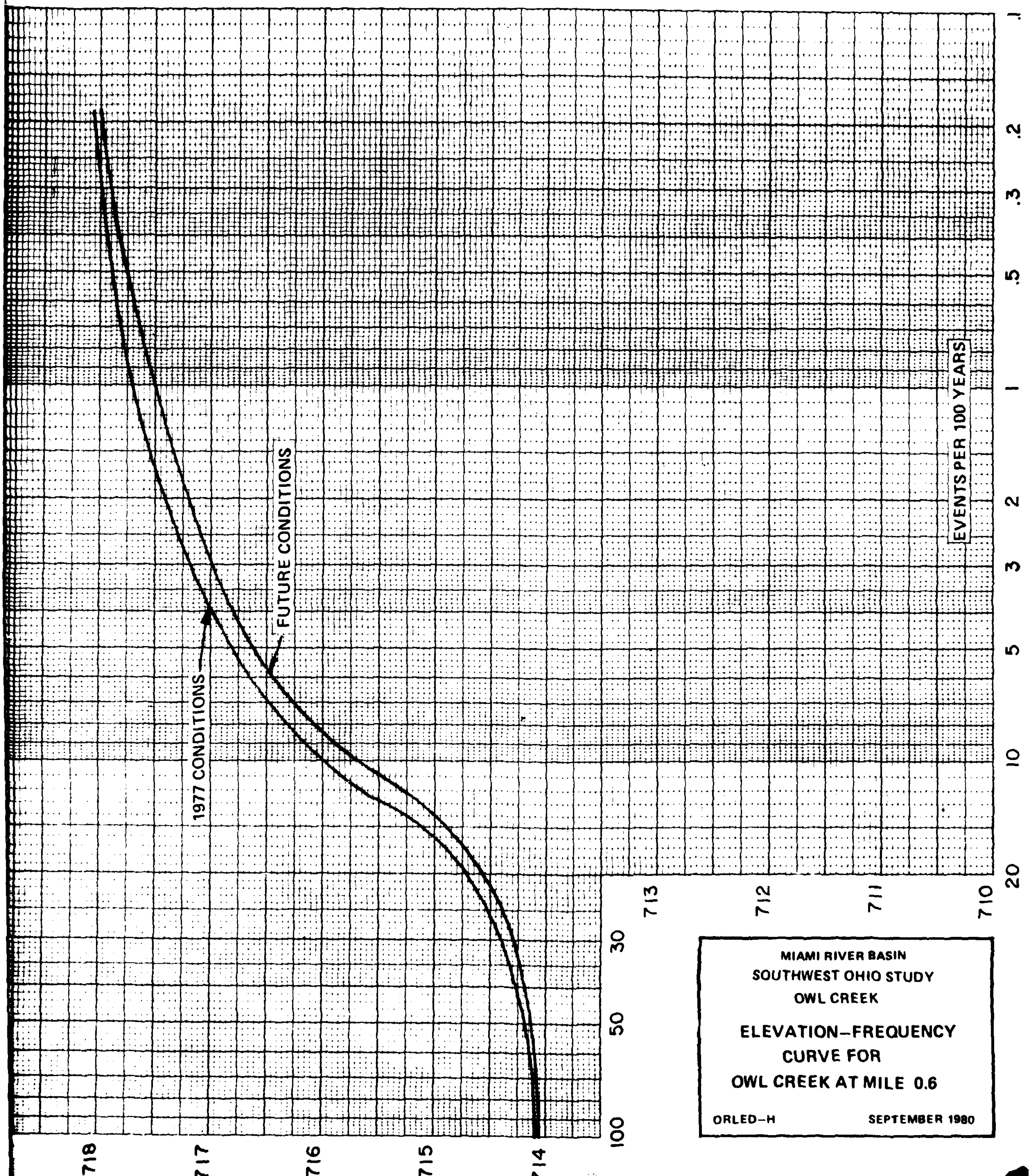
MIAMI RIVER BASIN
SOUTHWEST OHIO STUDY
OWL CREEK
ELEVATION–FREQUENCY CURVE
FOR
PONDING AREA ON RIGHT BANK
BETWEEN CONRAIL R.R.
AND ELM STREET

ORLED–H SEPTEMBER 1980

2



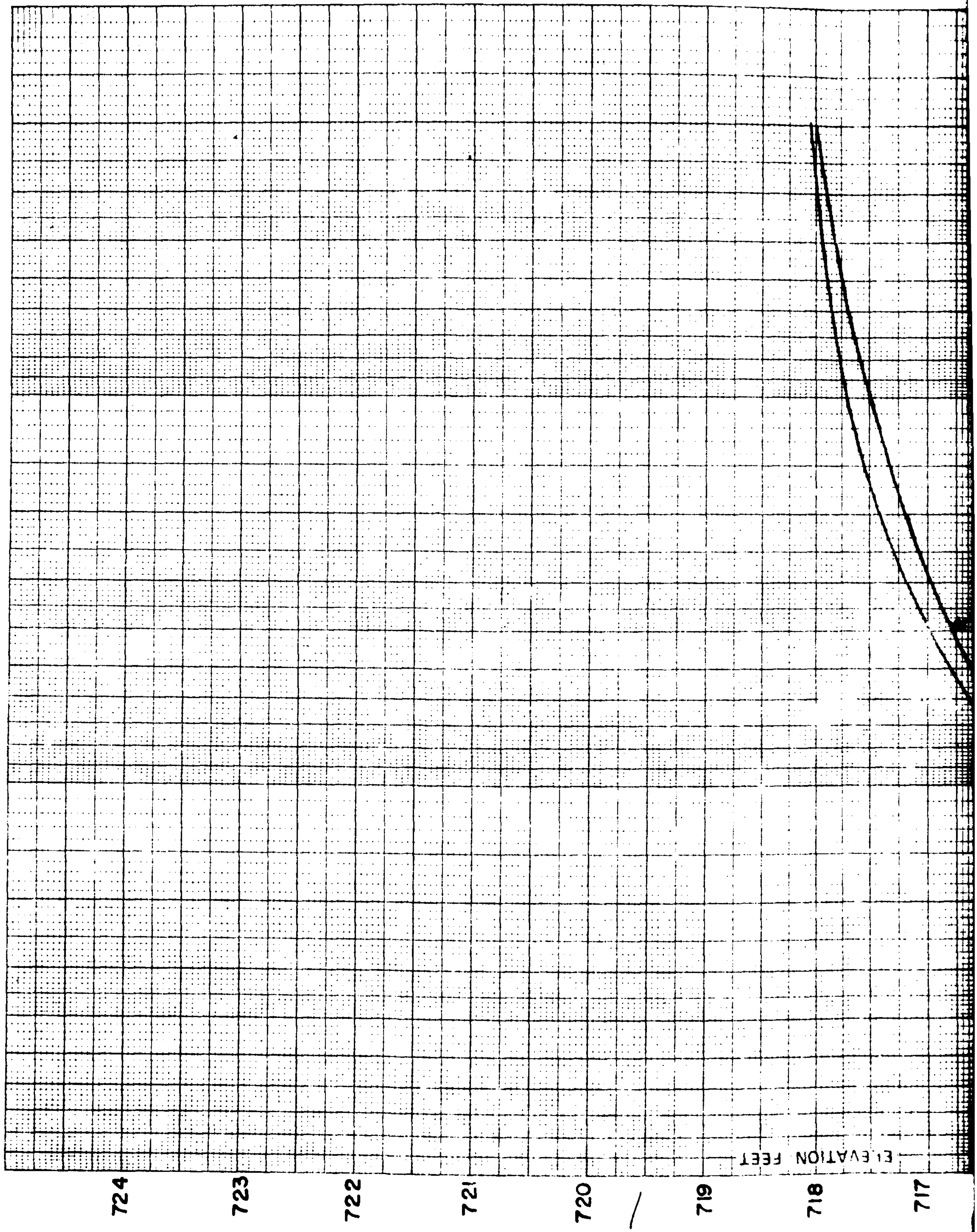
723
722
721
720
719
718
717
1977 CONDITIONS

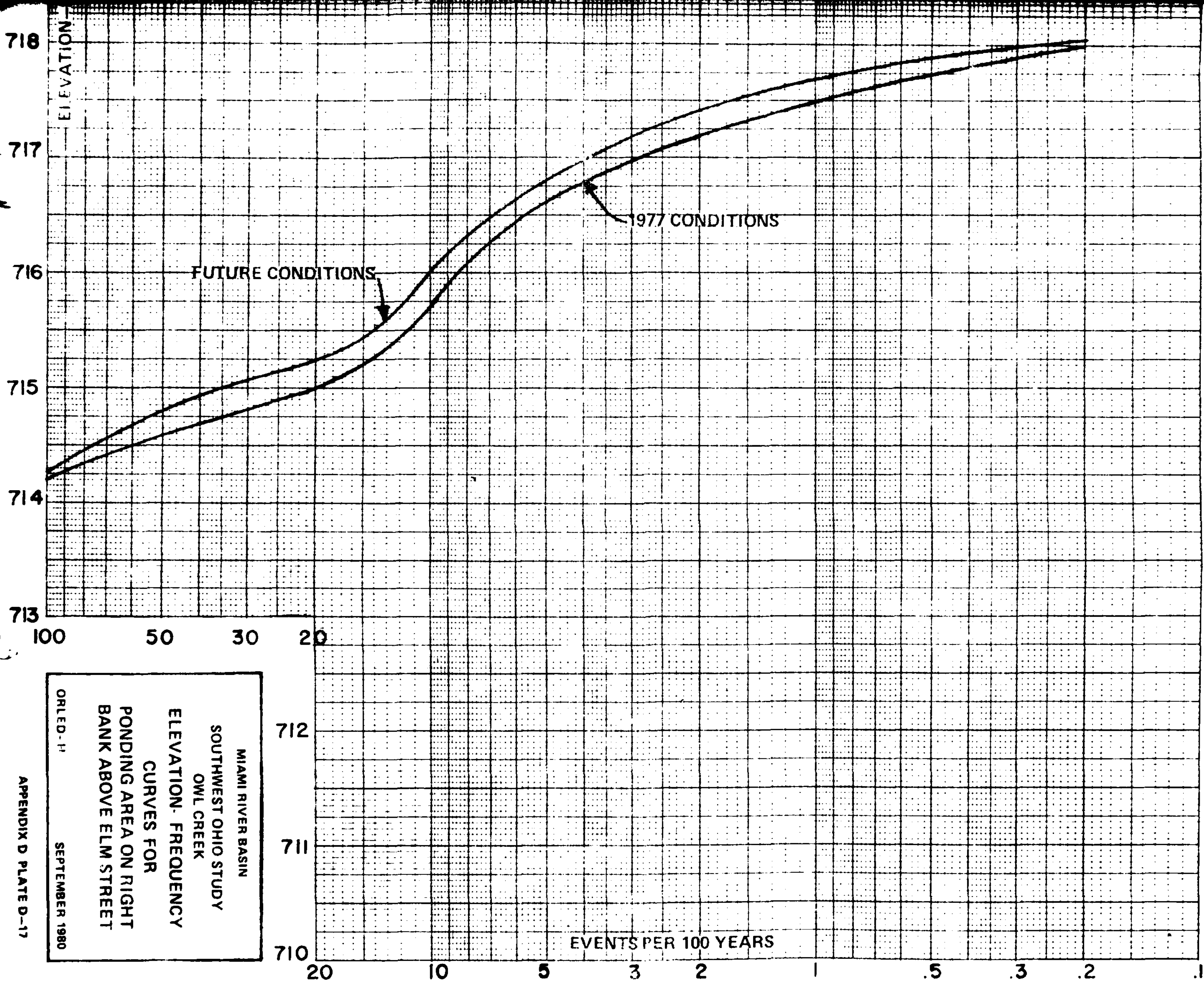


MIAMI RIVER BASIN
SOUTHWEST OHIO STUDY
OWL CREEK

ELEVATION–FREQUENCY CURVE FOR OWL CREEK AT MILE 0.6

ORLED–H SEPTEMBER 1980


ELEVATION FEET
724
723
722
721
720
719
718
717

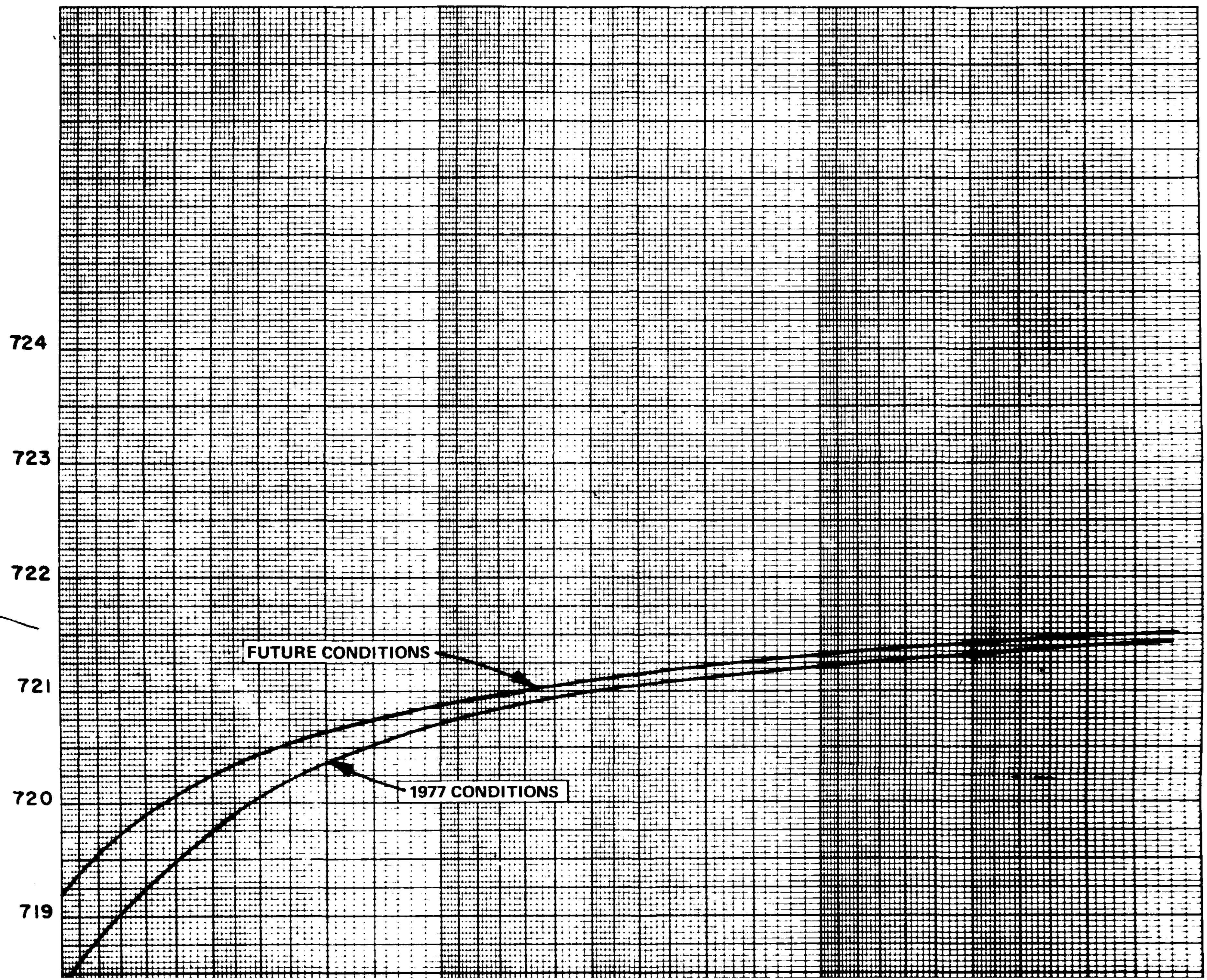


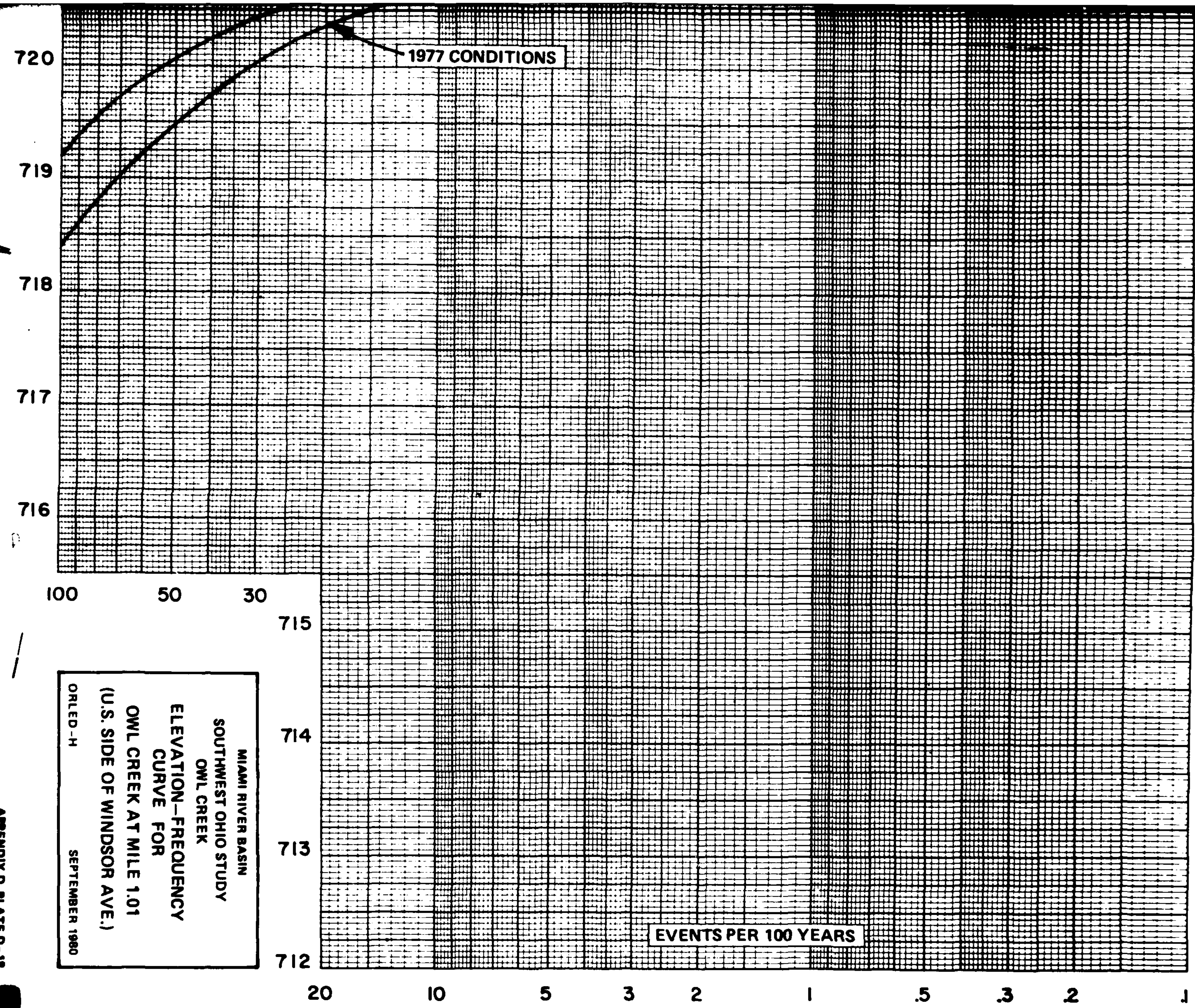
MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY
OWL CREEK

ELEVATION- FREQUENCY
CURVES FOR
PONDING AREA ON RIGHT
BANK ABOVE ELM STREET

ORLED-H SEPTEMBER 1980

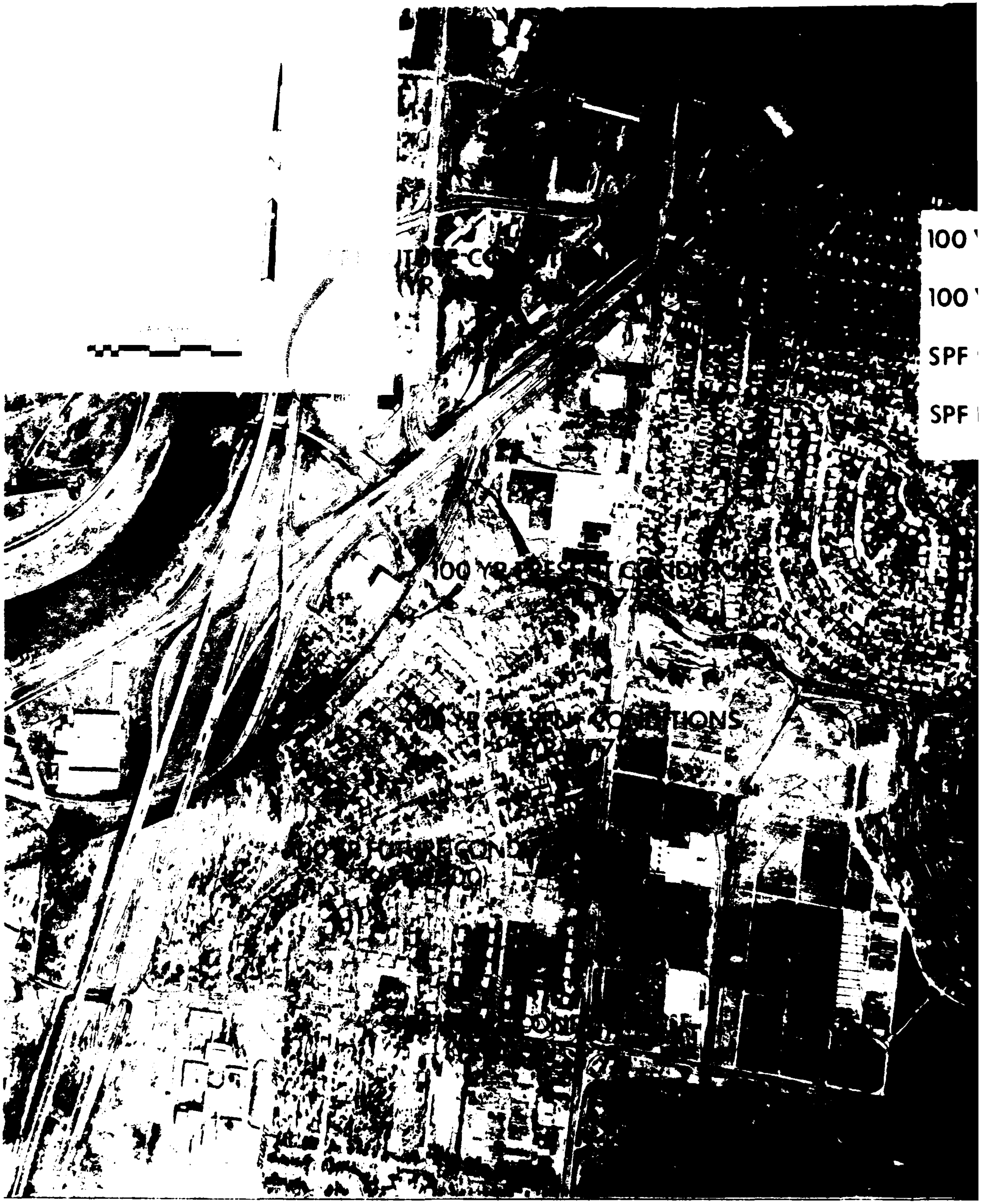

724
723
722
721
720
719
FUTURE CONDITIONS
1977 CONDITIONS

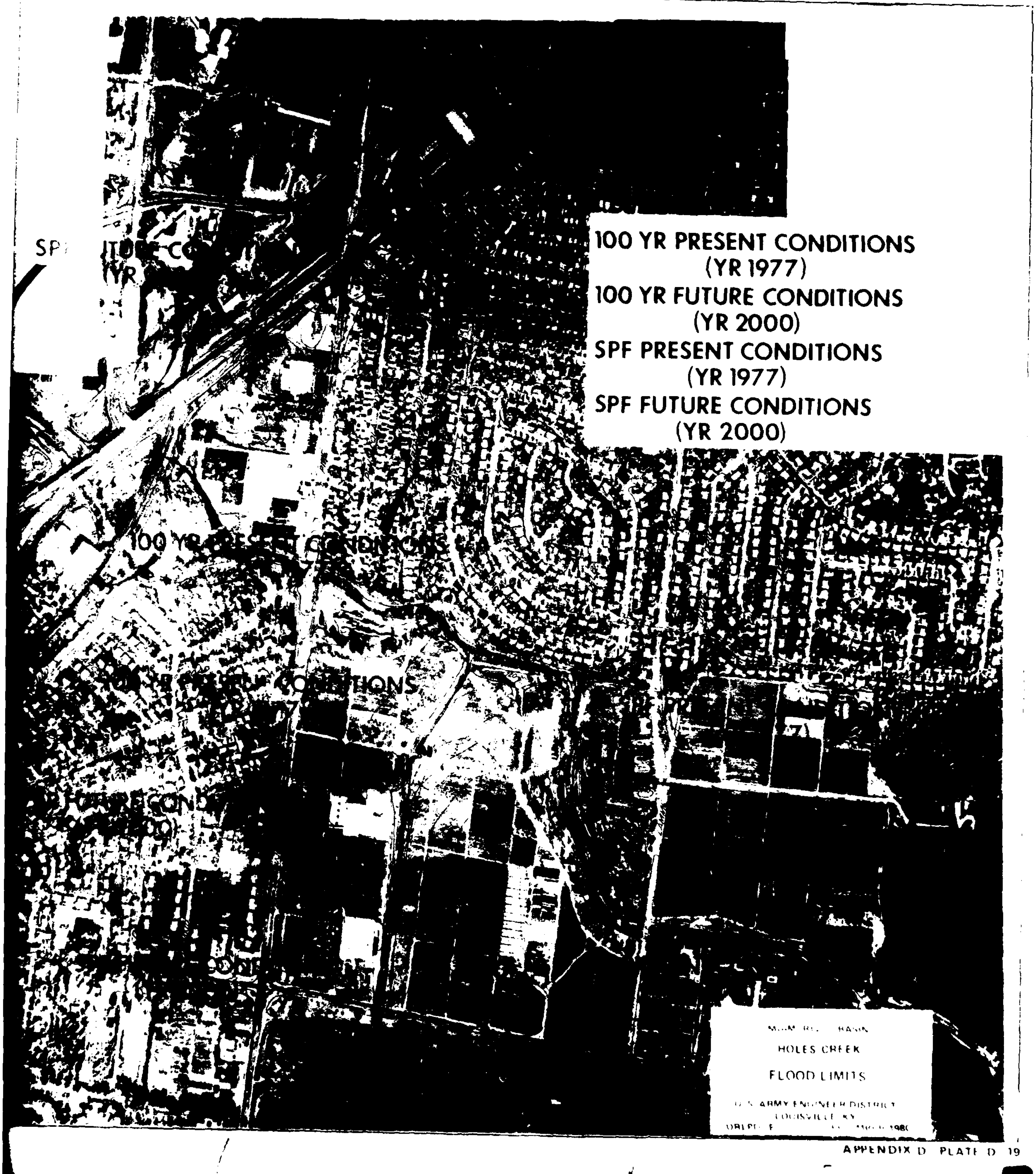


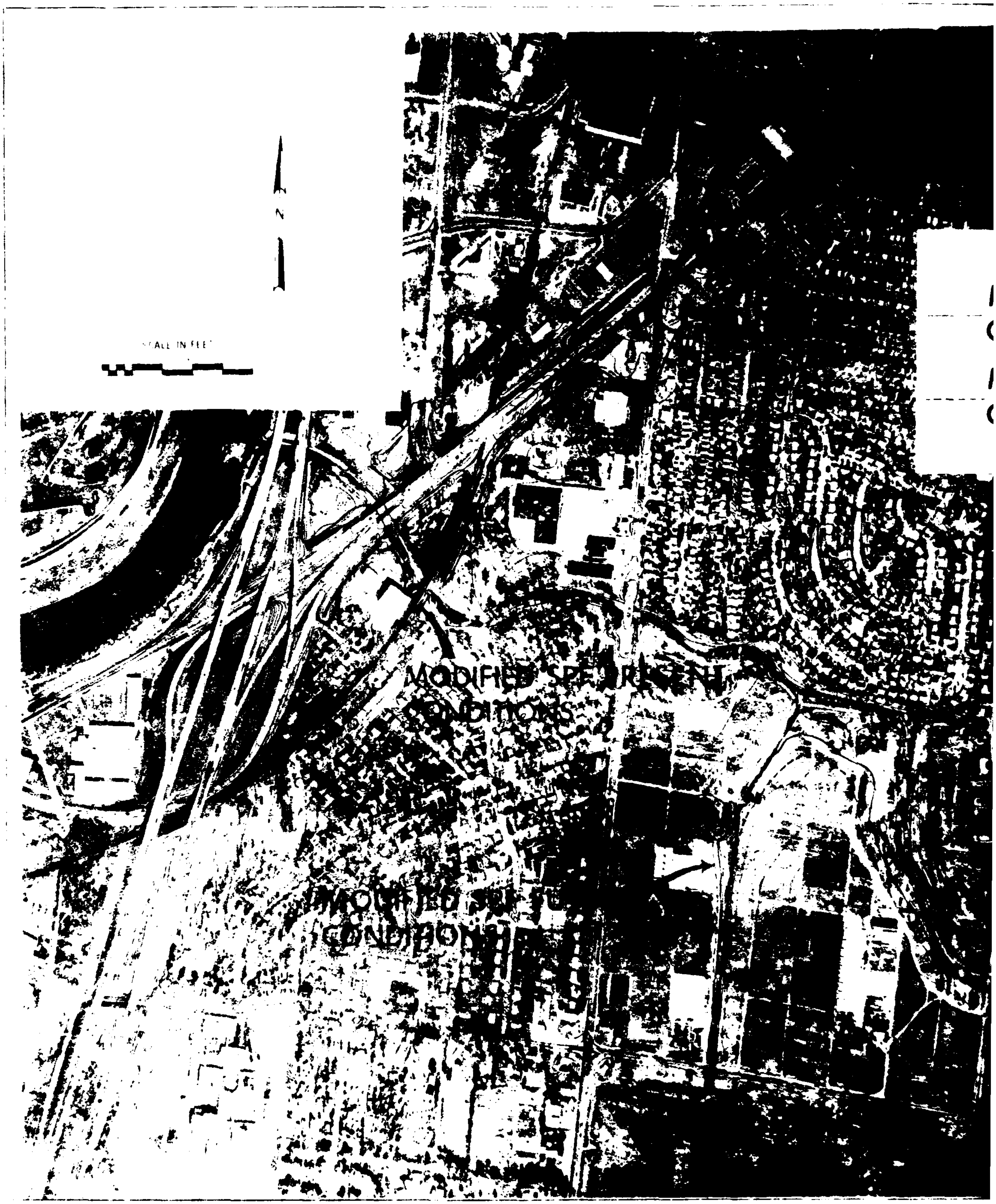
MIAMI RIVER BASIN
SOUTHWEST OHIO STUDY
OWL CREEK

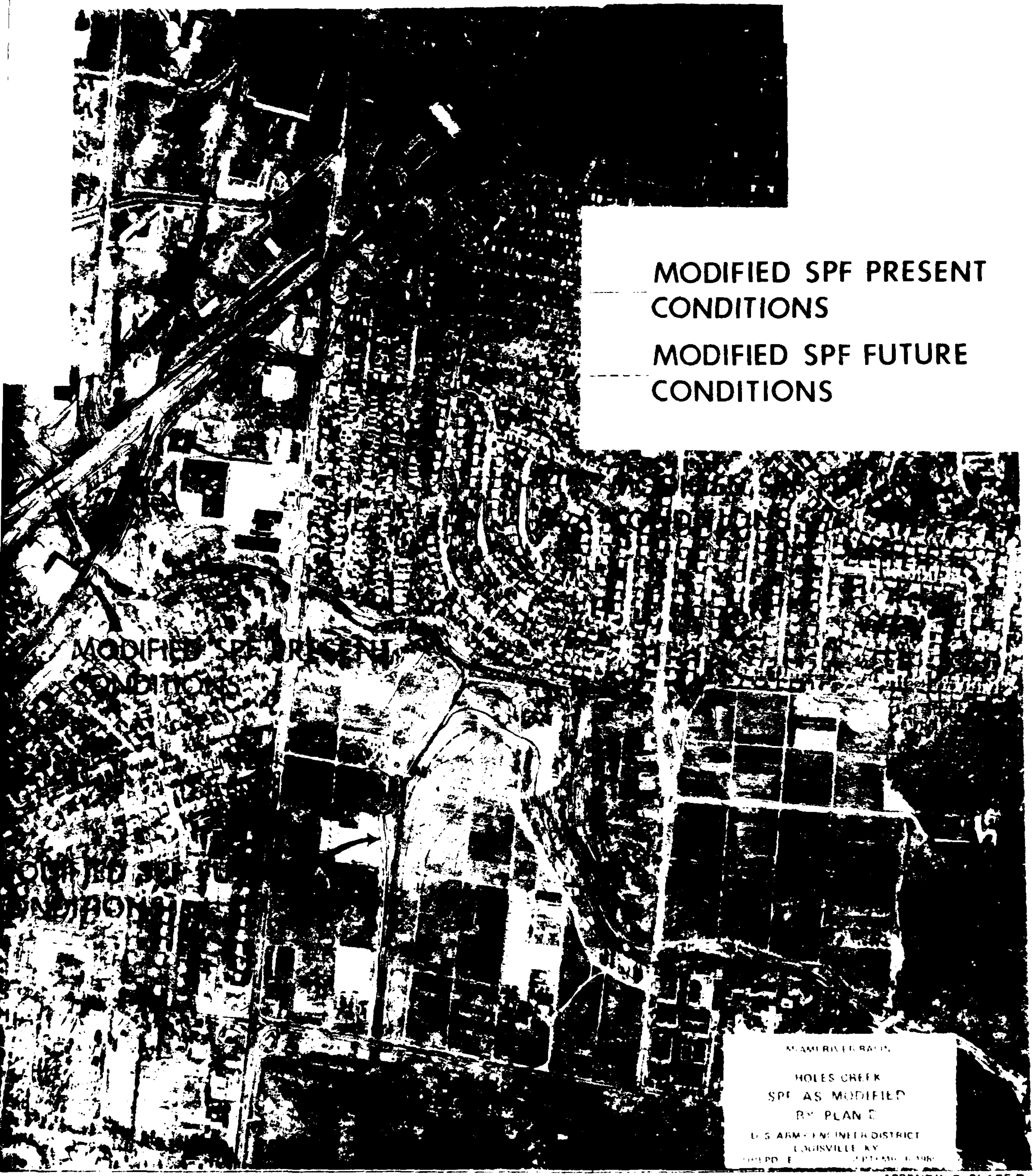
ELEVATION–FREQUENCY CURVE FOR
OWL CREEK AT MILE 1.01
(U.S. SIDE OF WINDSOR AVE.)

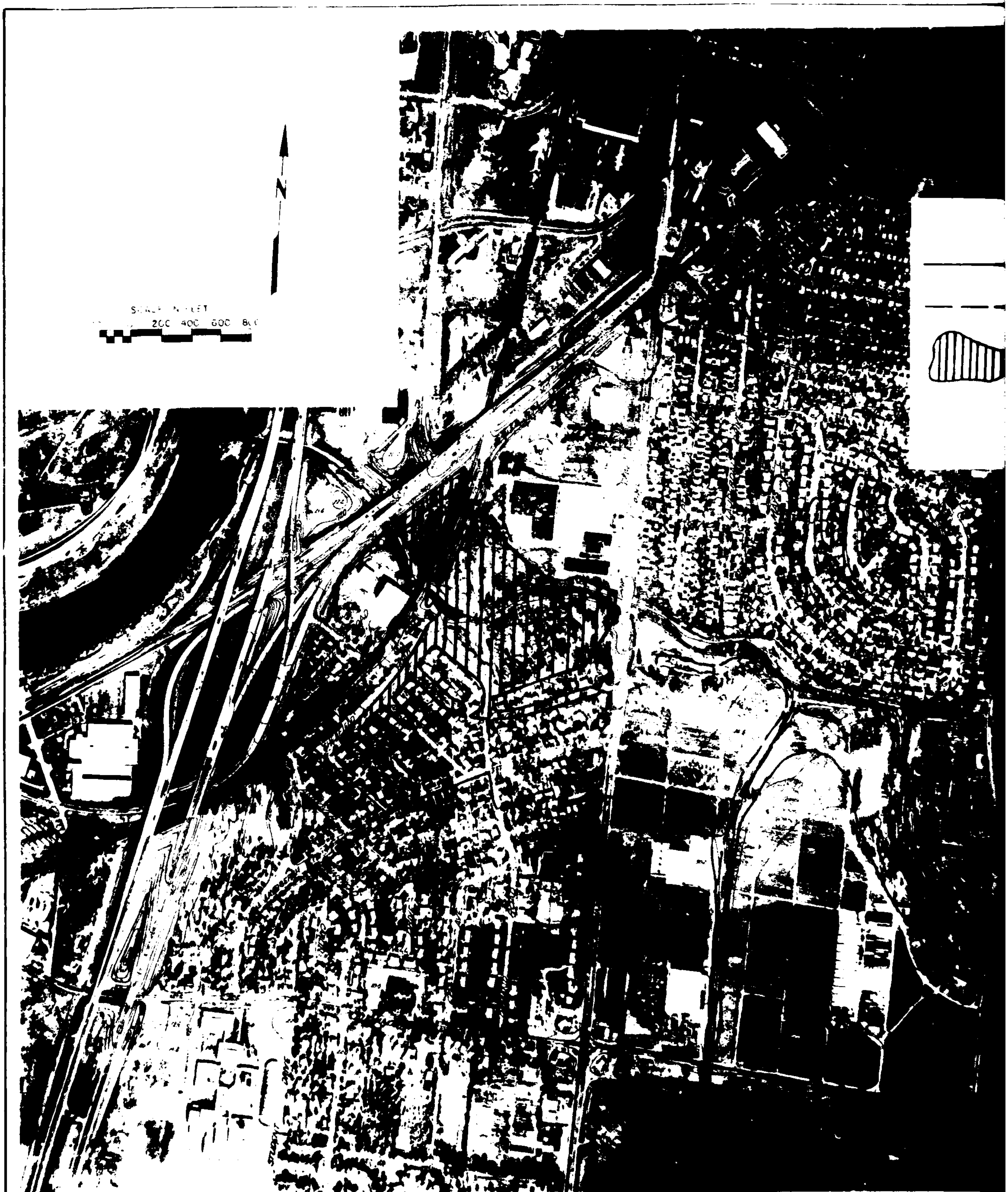
ORLED-H SEPTEMBER 1980


100 Y
100 Y
SPF
SPF

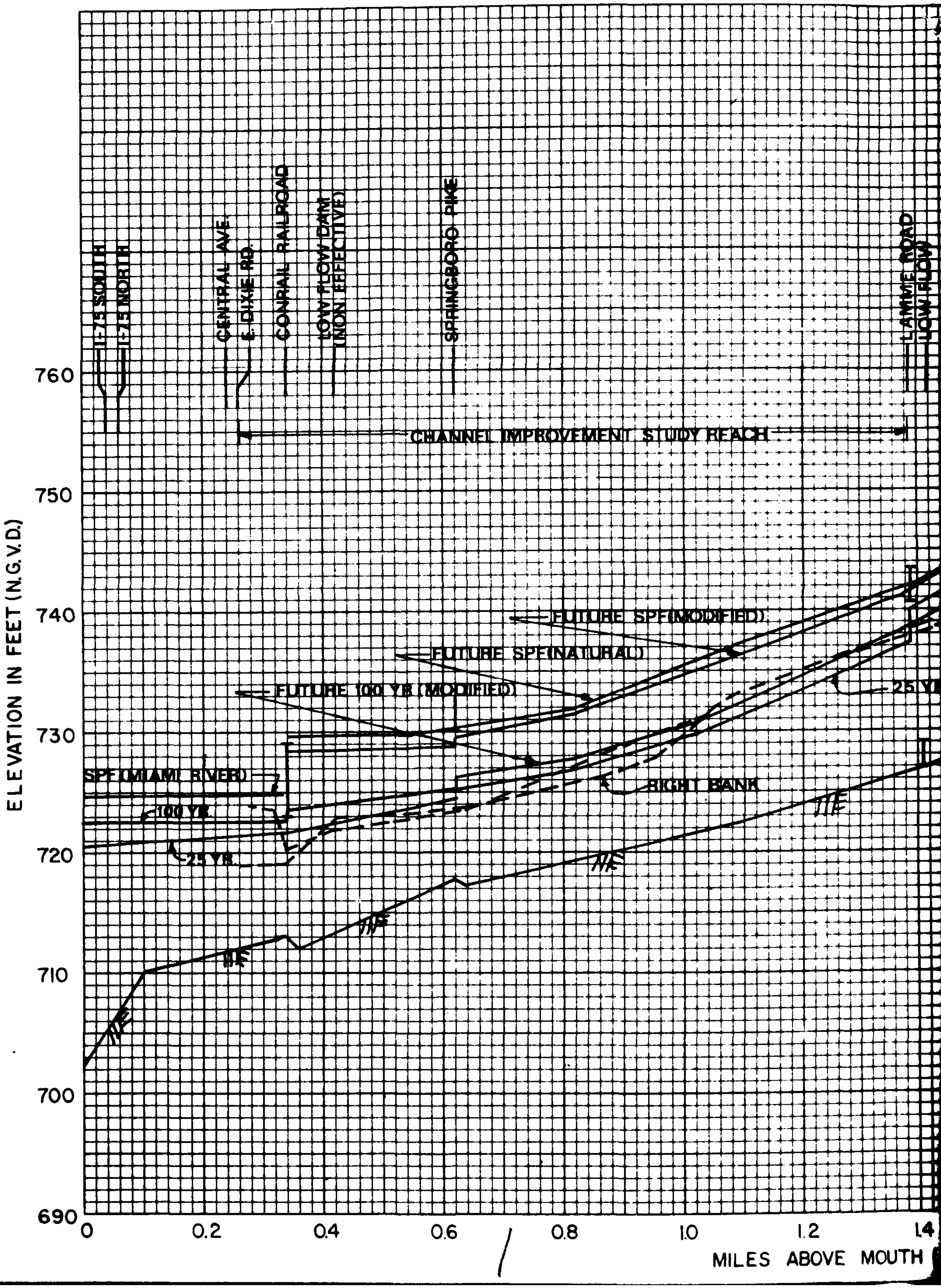

100 YR PRESENT CONDITIONS
(YR 1977)
100 YR FUTURE CONDITIONS
(YR 2000)
SPF PRESENT CONDITIONS
(YR 1977)
SPF FUTURE CONDITIONS
(YR 2000)
HOLES CREEK
FLOOD LIMITS


N
MODIFIED
CONDITIONS

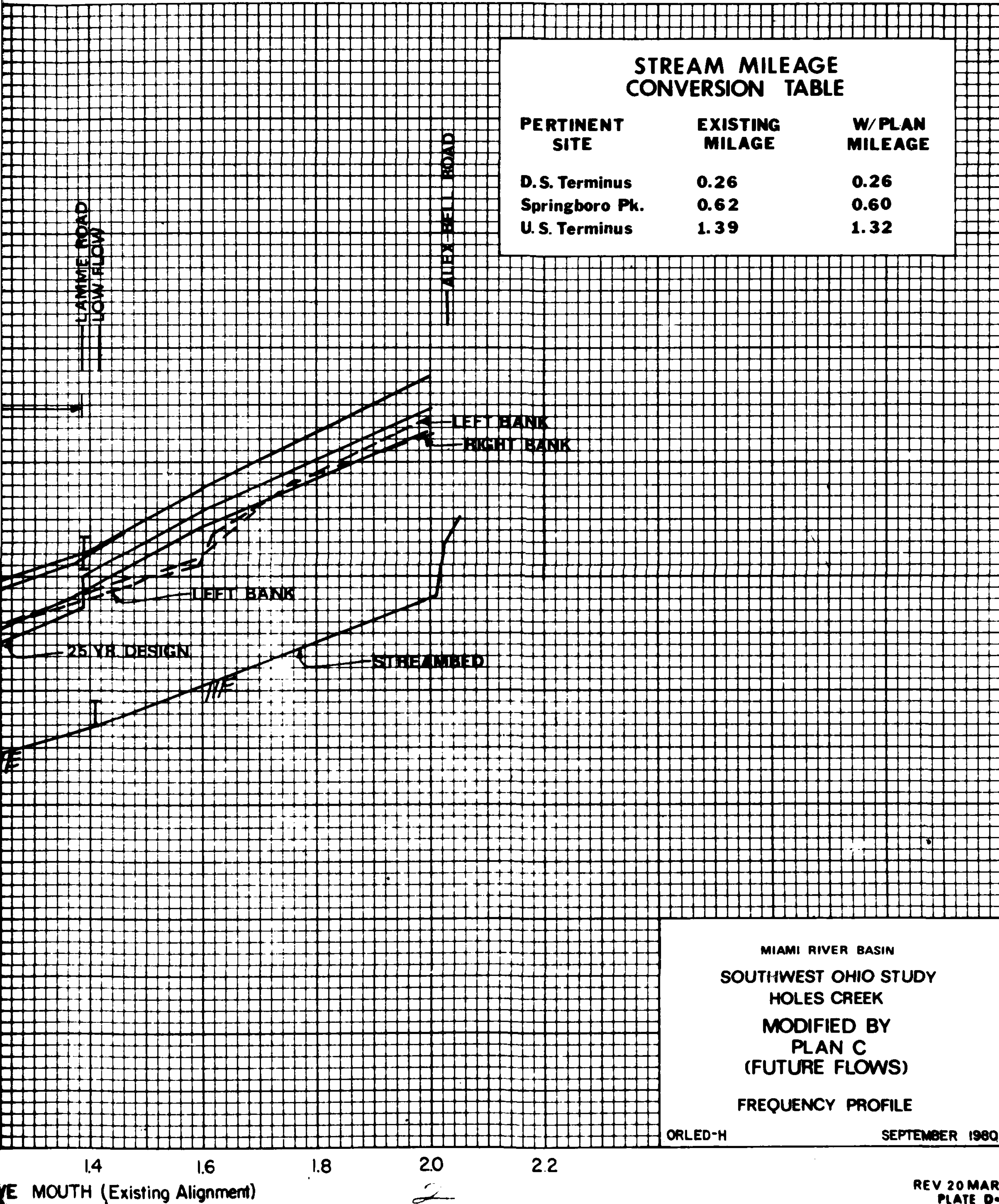

MODIFIED SPF PRESENT CONDITIONS
MODIFIED SPF FUTURE CONDITIONS
MODIFIED SPF PRESENT CONDITIONS
HOLES CREEK
SPF AS MODIFIED
U.S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY


N
200 400 600

REV 20 MAR 81
PLATE



I-75 SOUTH
I-75 NORTH
CENTRAL AVE.
E. DIXIE RD.
CONRAIL RAILROAD
LOW FLOW DAM (NON EFFECTIVE)
SPRINGBORO PIKE
LAMME ROAD
LOW FLOW
CHANNEL IMPROVEMENT STUDY REACH
FUTURE SPF(MODIFIED)
FUTURE SPF(NATURAL)
FUTURE 100 YR (MODIFIED)
SPF(MIAMI RIVER)
100 YR
25 YR
RIGHT BANK
25 YR
ELEVATION IN FEET (N.G.V.D.)
760
750
740
730
720
710
700
690
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
MILES ABOVE MOUTH



STREAM MILEAGE CONVERSION TABLE

PERTINENT SITE	EXISTING MILAGE	W/PLAN MILEAGE
D.S. Terminus	0.26	0.26
Springboro Pk.	0.62	0.60
U.S. Terminus	1.39	1.32

MIAMI RIVER BASIN

SOUTHWEST OHIO STUDY
HOLES CREEK

MODIFIED BY
PLAN C
(FUTURE FLOWS)

FREQUENCY PROFILE

ORLED-H SEPTEMBER 1980

REV 20 MAR 81
PLATE D-2

APPENDIX D ADDENDUM D-1

FLOOD PROBABILITY

The purpose of this addendum is to provide additional information verifying the reasonableness of the Holes Creek discharge-frequency curve, which was developed using Soil Conservation Service (SCS) procedures in HEC-1.

There were fourteen (14) years of gaged discharge data on Holes Creek when studies begain in 1977. The Miami Conservancy District (MCD) in Dayton, Ohio, was the local agency collecting this data on Holes Creek. The data collected were annual peaks only. The data furnished our office consisted of a tabulation of annual peak discharges and associated peak stages, zero datum of the gage, and a copy of MCD's rating curve. The period of record furnished by MCD was 1961-1974. MCD indicated at that time to use the data cautiously, because of the limited nature of the data being furnished, and the approximate nature of the discharge.

The flood of record on Holes Creek occurred in January 1959. The U.S. Geological Survey (USGS) used highwater elevations and cross-section from MCD to make slope-area computations on Holes Creek just downstream of Mad River Road. The published peak discharge of 4,730 cfs is based on this slope-area computation. In addition to the discharge data discussed above, MCD also furnished the highwater elevations on Holes Creek for the January 1959 flood.

A review of the discharge and stage data, the preliminary rating curve, the slope-area measurement for the January 1959 flood, and the highwater elevations for the January 1959 flood yielded inconsistencies, as follows:

(a) The plotted discharge measurements resulted in a scattered effect, with only two measurements available between 300 cfs and 1,400 cfs. No measurements are available above 1,400 cfs. The rating curve adopted, was extrapolated above 1,400 cfs. The majority of the measurements plotted ranged between 2.0 and 30 cfs.

(b) The slope-area measurement for the January 1959 peak discharge was not used to develop the upper limit of the rating curve. Data on the 1959 flood are tabulated below. It represents actual field measurements, and an estimate for the 1959 flood based on extrapolated rating curve; conflicting data is apparent.

Condition	Peak Discharge (cfs)	Stage (feet)
Actual field measurements	4,730	9.0
Extrapolated	4,730 1/	6.5 2/
Rating curve data	7,900 2/	9.0 1/

1/ Field measurement data.
2/ Extrapolated rating curve data.

(c) Ten of the fourteen years of record discharge data provided was based on extrapolated data above 1,400 cfs. This lended less reliability to the peak discharges furnished, and a log-Pearson Type III distribution. However, the data were used to develop a discharge-frequency curve, considering Water Resources Council (WRC) guidelines. Results of this analysis is discussed later in this addendum on how they compared to the adopted discharge-frequency data.

For the reasons discussed above, another approach to determine discharge-frequency data was required. Since the regional discharge-frequency study for flood insurance studies in Preble, Montgomery, Shelby, and Miami Counties, Ohio, had not been started, a rainfall-runoff approach was needed to determine flood hydrograph data, reflect the changing effects of urbanization, and to predict future runoff conditions. The Soil Conservation Service (SCS) procedure was chosen because of its adaptability for ungaged areas, its reflection of land uses (rural, residential, or industrial), and its availability in HEC-1, a computerized program developed by the Hydrologic Engineering Center, U.S. Army Corps of Engineers. The SCS Technical Release No. 55, "Urban Hydrology for Small

Urban Watersheds," was followed. A unit hydrograph based upon time of concentration, drainage area, and the standards of volume under the rising side of the hydrograph was used. For Holes Creek, a computation interval of 1 hour was used. Time of concentration (TC) required in HEC-1 was based on overland flow charts, slope-area computations for bankfull conditions and step backwater computations within the study area. SCS curve numbers were determined by weighing values obtained from Technical Release No. 55. Soil types were obtained from an "Inventory of Ohio Soils -- Montgomery County, Ohio." Land uses for present conditions were taken from 1977 aerial photographs. The validity of the HEC-1 rainfall-runoff procedures was checked by reproduction of the published peak discharge for the January 1959 flood on Holes Creek at Mad River Road, as described in Appendix D.

The "synthetic storm" techniques, also described in Appendix D, were used to determine a range of peak frequency discharges for present conditions. The 1959 flood plotted as a 20-year event on Holes Creek, using this technique. A check on some gaged streams similar to Holes Creek indicated the 1959 flood to be about a 25-year event. This was considered a reasonable check for Stage 2 studies.

Prior to Stage 3 studies, a more detailed regional discharge-frequency study had been undertaken in connection with flood insurance studies for Preble, Montgomery, Shelby, and Miami Counties, Ohio. WRC guidelines were adhered to for this regional analysis. This study included streams in urbanized areas, and also considered the parameters of drainage area, average watershed slope, and percent urban development. Over 20 stream gaging stations were used in the regional analysis. A skew coefficient of -0.2 best fitted the data, and is the same skew coefficient developed earlier for a more comprehensive Indiana frequency study.

Plates 1 and 2 of this Addendum show the 10- and 100-year discharges versus drainages, respectively, derived from the above study. For drainage areas greater than 20 square miles, a series of parallel lines were formed for long term gages. For drainage areas less than 10 square miles, there was sufficient long term data to develop a relationship of 10- and 100-year discharges to

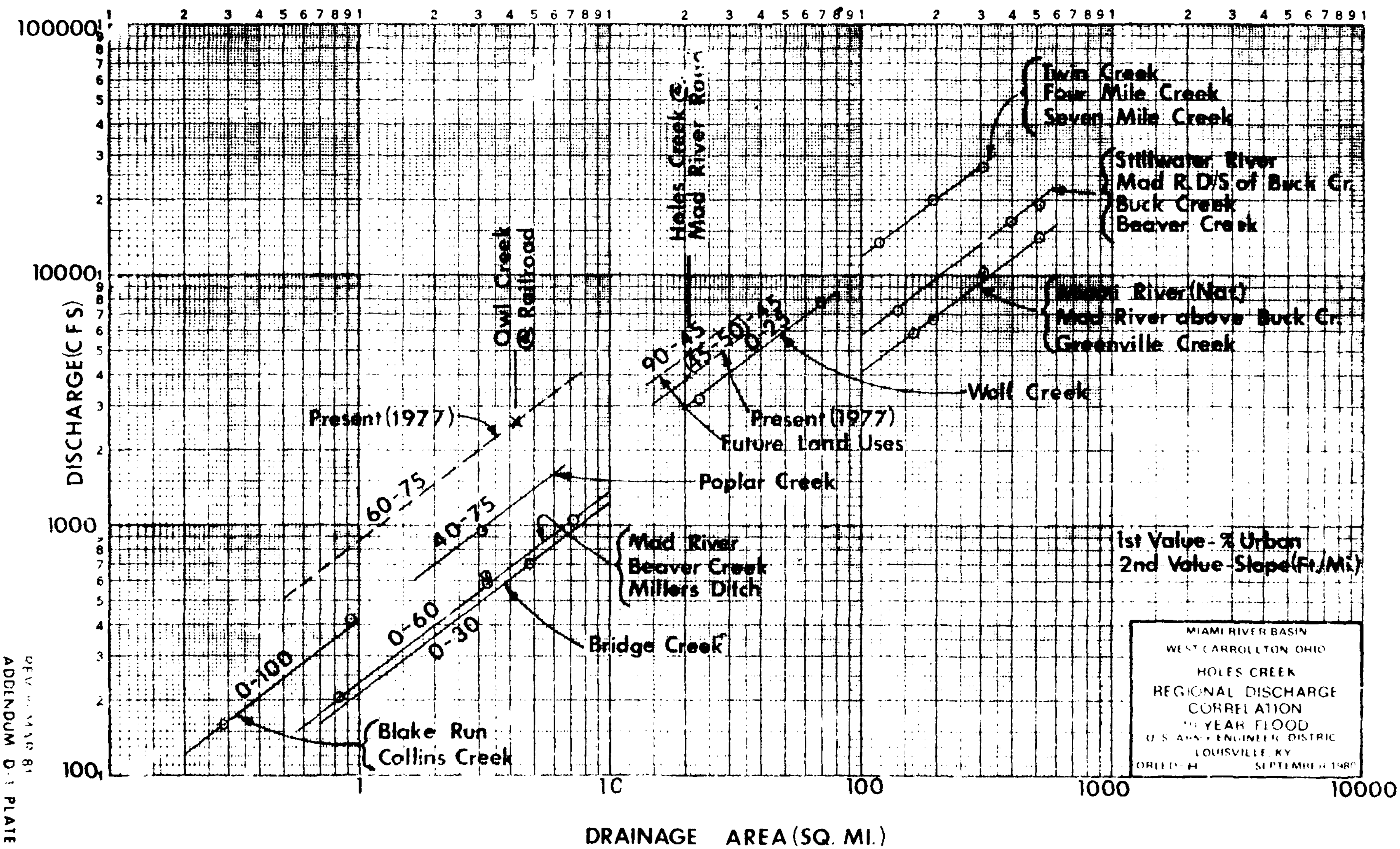
percent urbanization and average basin slope. Results of other studies for 10 square miles or less (Jefferson County, Kentucky; Marion County, Indiana; and Hamilton County, Ohio) show that these two factors were important influences on frequency discharges, and that a series of parallel lines was formed for different streams. The slope of the parallel lines was selected by first plotting all 100-year discharges computed in the gage analysis for long term stations, and checking it against the slopes of the curves for the 1959 flood discharges, Plate 3 of this Addendum. The 1959, 10- and 100-year curves have essentially the same slopes. The values assigned to the curves for 10 square miles and less are the percent urbanization and the average basin slope (feet per mile) above the gaged point, respectively.

As of 1977, 45 to 50 percent of the watershed above Mad River Road had been urbanized. The average basin slope above Mad River Road is 45 feet per mile. The 10- and 100-year discharges generated by HEC-1 for Holes Creek at Mad River Road are 3,900 cfs and 6,550 cfs, respectively, for present conditions. When plotted on Plates 1 and 2 of this Addendum, they match reasonably well with the percent urbanization and basin slopes for gaged areas below 100 square miles. This was considered reasonable confirmation of the discharge-frequency curve for Holes Creek.

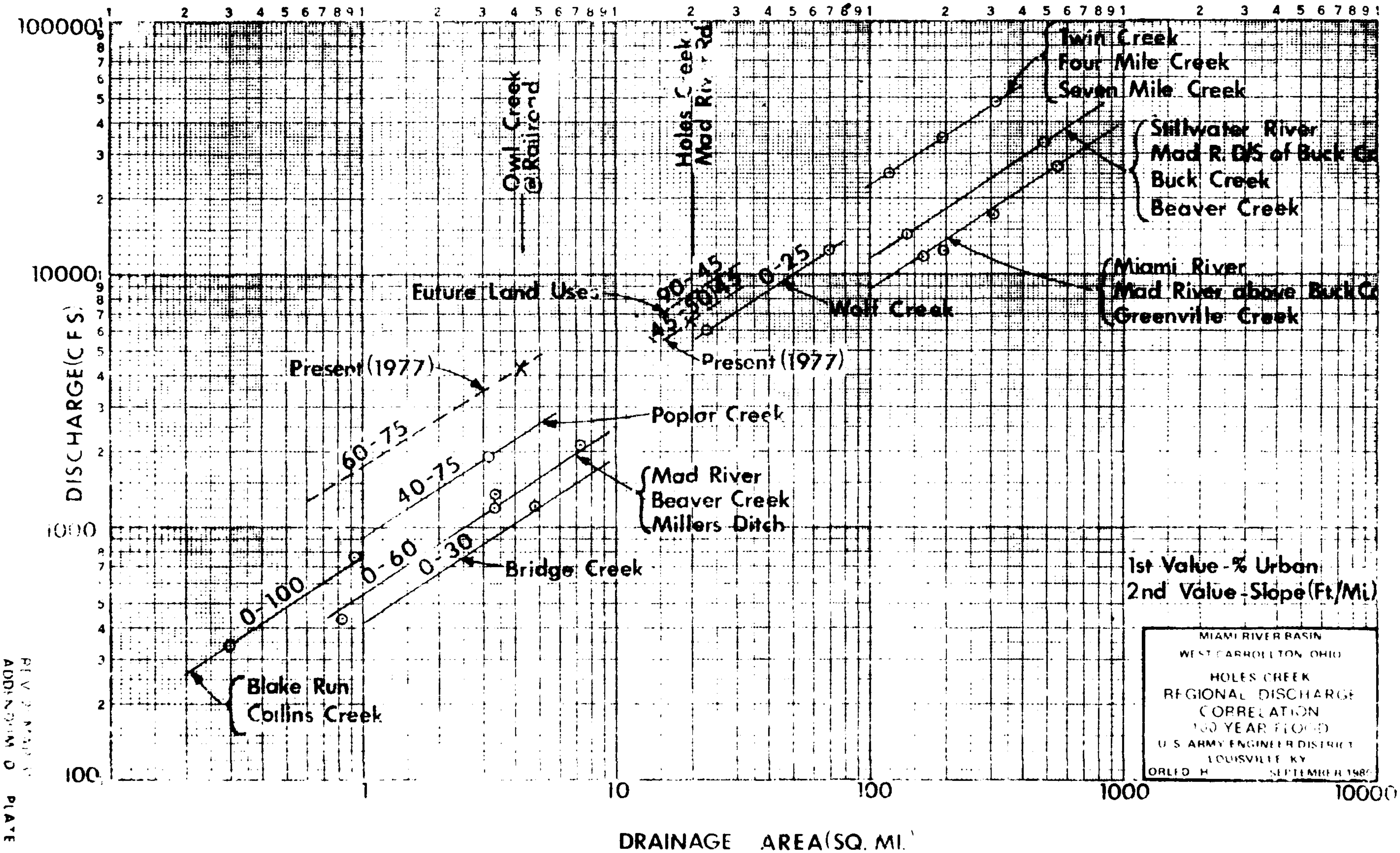
A log-Pearson Type III distribution was peformed on the peak discharges furnished by MCD, as discussed in preceding paragraphs on reliability of data. WRC guidelines were adhered to, such as skewness, low and high outliers, and extending the period of record. The regional skew coefficient of -0.2 was used. The period of record was extended back to 1913, assuming the 1959 flood was the highest since that time. These analyses yielded 10-year discharges ranging from 4,200 to 4,600 cfs, and 100-year discharges ranging from 8,400 to 9,400 cfs. This would be for present flow conditions. When compared to the regional curves, Plates 1 and 2, they appear high, based on basin slope and percent urbanization. Because of the questions regarding the base discharge data, these analyses were not considered reliable enough for design studies.

Discharge-Frequency, Future Land Uses

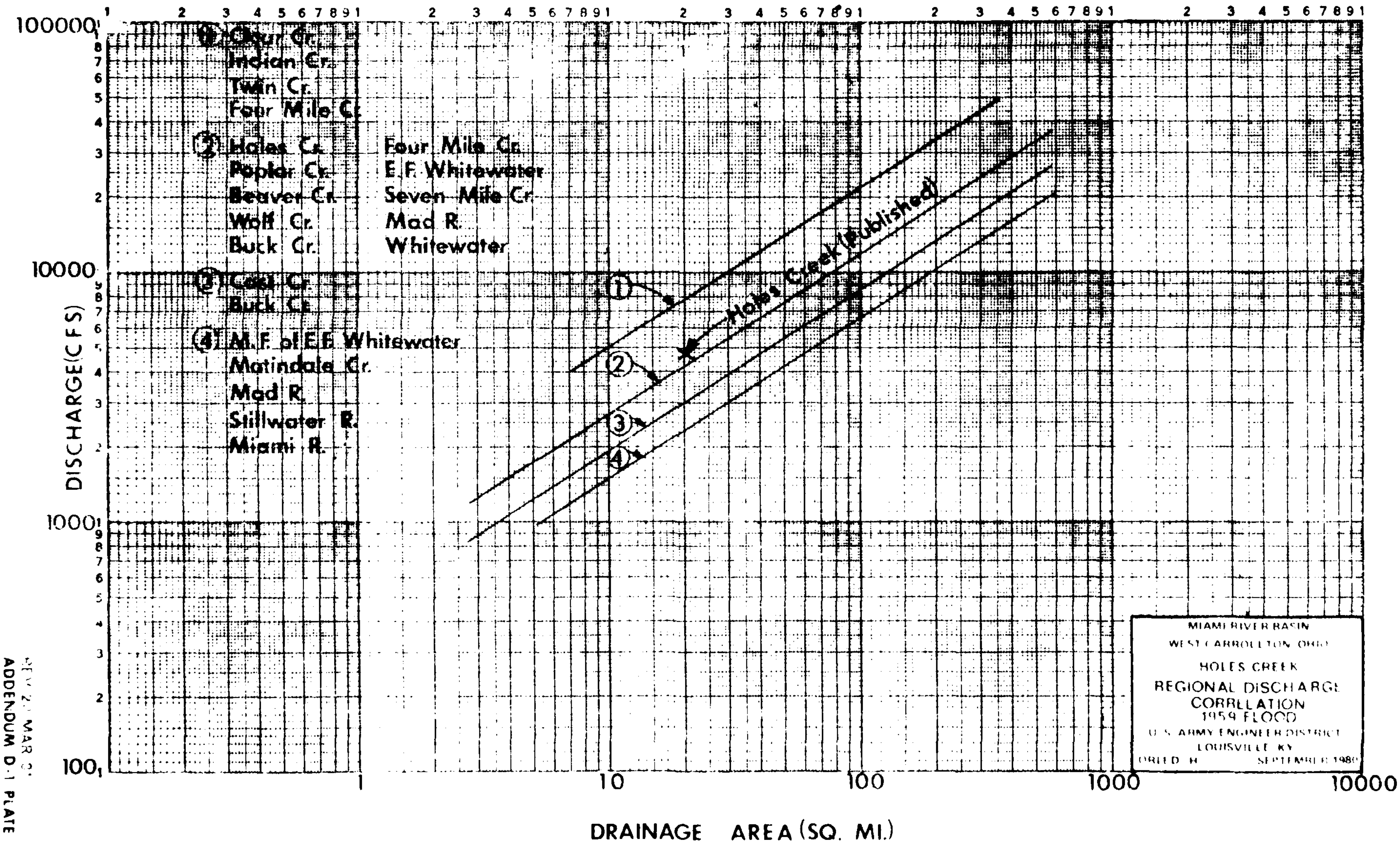
The flexibility of the HEC-1 computer model permits the parameters of time of concentration (TC) and curve numbers (CN) to be changed. Future land uses were obtained from the West Carrollton City Planning Commission, and the Miami Valley Regional Planning Commission. Overland travel times were modified to meet these future land uses. Channel travel times were modified in those areas which required some channel work. It was assumed that Manning's "n" would be 10 percent smoother in each instance. The total channel travel time to Mad River Road was reduced accordingly. These revised curve numbers and time of concentration values were incorporated into the HEC-1. Based on future land use projections, 90 percent of the watershed will be developed. Future land uses will be primarily residential. The 10- and 100-year discharges generated for Holes Creek at Mad River Road is 5,000 cfs and 8,150 cfs for future land uses. When plotted on Plates 1 and 2 for 90 percent urbanization and 45 feet per mile slope, it also matches reasonably well with the gaged areas below 100 square miles. These future land-use discharges were used for design studies in the present report.



REV. MAR 81
ADDENDUM D-1 PLATE 1



MIAMI RIVER BASIN
WEST CARROLLTON, OHIO
HOLES CREEK
REGIONAL DISCHARGE
CORRELATION
100 YEAR FLOOD
U.S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY
ORLFD. H. SEPTEMBER 1980
DISCHARGE (C.F.S.)
DRAINAGE AREA (SQ. MI.)
1st Value - % Urban
2nd Value - Slope (Ft/Mi.)
Twin Creek
Four Mile Creek
Seven Mile Creek
Stillwater River
Mad R. D/S of Buck Cr.
Buck Creek
Beaver Creek
Miami River
Mad River above Buck Cr.
Greenville Creek
Wolf Creek
Holes Creek
Mad River Rd.
Owl Creek
@ Railroad
Future Land Use
Present (1977)
Poplar Creek
Mad River
Beaver Creek
Millers Ditch
Bridge Creek
Blake Run
Collins Creek
0-100
0-60
0-30
40-75
60-75
0-25
90-45


Indian Cr.
Twin Cr.
Four Mile Cr.
② Holes Cr.
Poplar Cr.
Beaver Cr.
Wolf Cr.
Buck Cr.
Four Mile Cr.
E.F. Whitewater
Seven Mile Cr.
Mad R.
Whitewater
Buck Cr.
④ M.F. of E.F. Whitewater
Matindale Cr.
Mad R.
Stillwater R.
Miami R.
Holes Creek (Published)
DISCHARGE (C.F.S.)
DRAINAGE AREA (SQ. MI.)
MIAMI RIVER BASIN
WEST CARROLLTON, OHIO
HOLES CREEK
REGIONAL DISCHARGE
CORRELATION
1959 FLOOD
U.S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
SEPTEMBER 1980

APPENDIX D ADDENDUM D-2

WATER SURFACE ELEVATIONS

The purpose of this addendum is to provide additional information supporting the reasonableness of the water surface elevations determined by HEC-2 and subsequent storage routings by HEC-1.

As stated in Appendix D, water surface elevations on Holes Creek were based on the HEC-2 computer program and supplementary hydrograph storage routings. Storage routings on Holes Creek included loss of flow to a ponding area above I-75. This occurs on the left bank between the Conrail Railroad and Springboro Pike. See page D-7 for a more detailed discussion of this area. The HEC-2 computer program was used to compute flooding elevations on the remaining study reaches of Holes Creek above Springboro Pike.

Mapping initially used for Holes Creek consisted of the regular topographic maps (1:24,000), plus contour mapping dating back to 1915. After initial studies indicated a project was feasible on Holes Creek, detailed mapping (2-foot contour interval, 1" = 200 feet) was developed for this stream in 1978. This detailed mapping supplemented the cross section data discussed below, and provided greater reliability for other engineering and economic studies. Cross section data on Holes Creek were collected in 1974. Prior to studies in 1977, a field reconnaissance of the Holes Creek area indicated no additional field work was required for the study area.

The only highwater mark elevations on Holes Creek were those collected by the Miami Conservancy District for the January 1959 flood. Based on precipitation data within the general area, and discharge data at the Mad River Road stream gage, Mile 3.36, the latest flooding event to have occurred on Holes Creek was in May 1968. However, no highwater mark elevations were collected for this event. Plate A-3 shows a plot of the January 1959 highwater mark elevations from the mouth upstream to the Mad River Road gage.

The HEC-2 computer model was developed for Holes Creek, using cross sections and mapping data described above. Discharge data discussed under the topic "Rainfall-Runoff Procedures and Flood Probability" was incorporated into each model. The remaining parameter required for calibration of these HEC-2 computer models is Manning's roughness coefficient "n."

Estimates of channel and overbank roughness coefficients on Holes Creek were made in the field, and checked against several technical references. These estimated values were incorporated into the HEC-2 computer model and calibrated to the January 1959 flood highwater elevations and published peak discharge data. It should be noted at this time that the Holes creek channel has been altered in a few isolated reaches between the mouth and the gage at Mad River Road since 1959. No changes have occurred in the immediate reach below the gage at Mad River Road. These changes have been in the form of minor localized channel widening and deepening. No realignment of the channel has occurred. These changes were taken into account when calibrating the HEC-2 model to the Janaury 1959 flood. Calibration of the model was considered acceptable when the model reproduced the 1959 highwater elevations to within one-half foot. A tabulation of channel and overbank roughness coefficients adopted for existing conditions on Holes Creek is given in the table below.

MANNING'S ROUGHNESS COEFFICIENTS
HOLES CREEK
EXISTING CONDITIONS

Steam	Manning's Coefficients		
Mileage	Channel	Overbank	Site Location
0.30	0.070	0.100	Below Conrail Railroad
0.52	0.065	0.080-0.100	Between railroad and Springboro Pike
0.64	0.070	0.045-0.100	Upstream of Springboro Pike

MANNING'S ROUGHNESS COEFFICIENTS (Continued)

HOLES CREEK

EXISTING CONDITIONS

Steam	Manning's Coefficients		
Mileage	Channel	Overbank	Site Location
1.38	0.060	0.045-0.100	Downstream of Lamme Road
1.60	0.060	0.100	Between Lamme Road and Alexandersville-Bellbrook Road

The initial studies carried the calibration up to Mad River Road (Mile 3.36) for purposes of tying into a gage. However, resulting economic studies indicated the study reach should be terminated at Alexandersville-Bellbrook Road (Mile 2.03). Therefore, this is the limit shown on Plates D-5, D-6, and D-9.

APPENDIX D ADDENDUM D-3

DESIGN CONSIDERATIONS

The purpose of this addendum is to provide additional information concerning riprap design, and velocity and duration data for the SPF, under design conditions.

Riprap was designed to the 500-year design flood and was based on criteria contained in EM 1110-2-1601. The following table shows a tabulation of velocity data for the 100-year, 500-year (design flood) and the SPF. These are channel velocities extracted from the HEC-2 (Water Surface Profiles) backwater computations, for the reach requiring extensive riprapping. This reach is from I-75 to a point 400 feet downstream of Springboro Pike.

CHANNEL VELOCITIES

500-YEAR RECOMMENDED PLAN

Stream Mileage	Bottom Width (Feet)	Top Width (Feet)	Channel Velocities (fps)		
			100-Year	500-Year	SPF
0.20	60	114	7.3	7.7	8.0
0.27	100	169	6.3	6.6	6.9
0.33	160	223	5.0	5.3	5.4
0.36	200	242	4.6	4.8	5.0
0.56	175	211	8.4	8.4	8.4

The velocities do not vary more than 10 percent between the 100-year and SPF events. This indicates that riprap would require minimum maintenance, even should a SPF be experienced. The required riprap is a 12-inch layer (minimum size permitted) of graded stone, W_{50}, 5 to 11 pounds.

The SPF on Holes Creek is in excess of a 1,000-year frequency flood. Consequently, a SPF would cause flooding conditions in the overbanks under design conditions. The table below shows a tabulation of SPF velocities for existing and design conditions at specific points within the study reach.

Duration of flooding in the Springboro Pike area for existing headwater conditions is about 18 hours for the Holes Creek watershed. With the recommended plan, duration of flooding in the overbanks would be reduced to about 5 or 6 hours in the Springboro Pike area. However, an occurrence of the SPF on the Miami River would have a much longer duration of flooding in the lower reach of Holes Creek.

STANDARD PROJECT FLOOD VELOCITIES
FOR A 500-YEAR CHANNEL PLAN
FOR HEADWATER CONDITIONS

Stream Mileage	Flood Event	Velocities (fps) 1/ Left Overbank	Channel	Right Overbank	Location/Comments
0.36	SPF 2/	0.4	1.5	0.4	Upstream of Railroad; low velocities for existing conditions indicative of flat pool at this location.
	SPF 3/	0.5	5.0	1.3	
0.64	SPF	1.2	2.6	0.9	Upstream of Springboro Pike; 10 fps for concrete-lined channel.
	SPF	1.3	10.0	0.6	
1.38	SPF	0.7	4.2	1.7	Downstream of Lamme Road.
	SPF	0.3	7.9	1.0	
1.60	SPF	1.9	6.5	2.2	Upstream side of Left Bank Apartments. (End of channel enlargement.)
	SPF	1.7	7.6	2.0	
2.01	SPF	2.3	8.4	2.5	Downstream of Alex-Bell Road.
	SPF	2.3	8.4	2.5	

Notes:

1/ Velocities represent future flow conditions.
2/ Future natural conditions.
3/ Modified by future 500-year channel plan.

APPENDIX E
ECONOMICS

APPENDIX E
ECONOMICS

Table of Contents

Table of Contents (Continued)

TABLES

Table of Contents (Continued)

TABLES (Continued)

Table of Contents (Continued)

FIGURES

Table of Contents (Continued)

PLATES

ADDENDA

Appendix E
Economics

This provides the detailed economic data necessary for economic evaluation of the considered plans. The section proceeds from a general discussion of methodology to the detailed cost estimates, the derivation of annual economic charges, and the analysis of benefits. Final paragraphs summarize the data use for economic justification, perform tests for sensitivity, and discuss maximization of net benefits.

Methodology

The tangible economic feasibility of considered plans can be ascertained by comparing the equivalent average annual costs (including interest, amortization, operation and maintenance, and major replacements) with an estimate of the equivalent average annual benefits which would be realized over a selected economic life. Values given to costs and benefits are made comparable by conversion to an equivalent basis using an appropriate interest rate. The applicable interest rate used in the economic analysis for this report is 7-1/8 percent. Benefits computed include those for the base year of 1985, which is assumed to be the earliest completion date for any considered plan, and average annual equivalent benefits expected after 1985.

Costs

Quantities for the cost estimates were based on 2-foot contour mapping, aerial photography of December 1978, detailed utility locations, and field notes. Unit prices based on October 1979 values and conditions were obtained by a review of recent bid data for similar type projects. Real estate appraisers estimated the rights-of-way costs. The largest cost items for

Plan D were the replacement of the railroad bridge and rights-of-way. Other major cost items were for excavation, riprap, and alterations to utilities. The following discussion on major cost items pertains to the selected plan (Plan D), but is also generally valid for the other considered plans.

Riprap is available in Montgomery and the adjacent counties of Preble and Warren. The riprap required is W50 (5 to 11 pounds). The areas requiring riprap are shown on plates in Appendix B. As stream velocities are not expected to exceed 8-9 fps riprap for slope protection is about 1-foot thick and is placed on a layer of filter cloth.

Channel excavation is expected to encounter no rock and consist primarily of gravel, sand, and silt deposits. These conclusions are based on surface and streambank observations, and review of available geological data. The rock line is reported to be over 100 feet below ground surface. Some of the excavated material will be used for filling the old channel and adjacent low areas. However, most of the excavated material will have to be hauled to disposal sites. Determining the best available site was beyond the scope of this investigation as future development could easily negate the availability of a site. To determine the appropriate cost for disposal it was assumed that some hauling would be necessary and the acquisition of temporary easements for the disposal sites. The gravel pits west of the Miami River were used as the bases for the easements costs. It was estimated that about 15 acres of gravel pits would be required. A total of about 55 acres of gravel pits are estimated to be available by 1985.

Individual utility companies were contacted to determine the location and type of any underground utilities in the affected area. Encasement and realignment of sewers and water lines were the main cost items. Existing utilities in the area are shown on Plate B-10.

Real Estate costs are based upon appraisals made in January 1980, but adjusted to October 1979 values. The line item includes all costs for lands, improvements, easements and severance. The cost include two buildings used in nursery's operation and a commercial building on Springboro Pike. No residential structures are affected. The total real estate cost, including mitigation lands, is about $1,300,000.

Replacing the Conrail Railroad bridge is the highest construction cost item. It is proposed that the relocated railroad be shifted north in order that the existing tracks can be used during construction of the new bridge. With this proposal no temporary runaround would be needed. The new bridge would be about 284 feet long, 24 feet wide, and 14 feet above streambed level.

Costs are also included for modification of the Springboro Pike bridge, for landscaping and plantings for aesthetics and wildlife purposes, and for establishing a low flow channel, and riffles and pools. The cost estimate for the low flow channel with pools and riffles is based on the plan shown on plates in Appendix B. An alternate plan that will be considered in any future engineering study would involve extensive use of gabions for creating pools and riffles. The cost of this procedure would be on the same magnitude as the proposed plans.

A summary of the first costs for the considered plans A, B, C and D is presented in Table E-1. These costs are based on October 1979 prevailing prices. Engineering and design, and supervision and administration costs are based on percentage data taken from curves furnished with DAEN-CWE letter dated 11 January 1974. Detailed costs estimates for the considered plans A, B, C and D are presented in Table E-2 thru E-5.

Costs for developing the recreation element are based on recent cost data for similar facilities. As the recreation development must be constructed on the lands acquired for the flood control plan and are dependent upon the desires and needs of the local sponsor, the exact type and quantity of facilities can only be estimated at this time. The detailed cost estimate for the facilities planned at this time is shown on Table E-6.

TABLE E-1

SUMMARY OF ESTIMATED FIRST COSTS ($1,000) 1/
CONSIDERED PLANS A,B,C,& D
WEST CARROLLTON, OHIO

FEATURE	EXISTING COST-SHARING			PROPOSED COST-SHARING 2/			
	FEDERAL	NON-FEDERAL	TOTAL	FEDERAL	LOCAL	STATE	TOTAL
Non-structural Plan - Flood Proofing 3/ Plan A	1,690	450	2,140	1,605	428	107	2,140
Holes Creek - Right Bank Levee Plan B	2,770	1,630	4,400	3,300	880	220	4,400
Holes Creek - 25-Year Channel Impr. Plan C	2,520	1,240	3,760	2,820	752	188	3,760
Holes Creek - 500-Year Channel Impr. Plan D	4,600	1,830	6,430	4,820	1,290	320	6,430

1/ October 1979 Prices & Conditions
2/ Proposed by President in "Remarks of the President on Water Policy," dated 6 June 1978; proposal is for each of the following to pay a set percentage of the total project cost:

Federal--------75%
Local----------20%
State---------- 5%

3/ Existing cost-sharing policy is 20% Non-Federal and 80% Federal.

TABLE E-2

ESTIMATED FIRST COSTS
PLAN A FLOOD PROOFING - HOLES CREEK
WEST CARROLLTON, OHIO

			(Rounded)
Permanent Closures (65 Units)			
Basement Windows	65 Houses	$1,830	$119,000
Basement Doors	33 Houses	900	30,000
Sewer Valves	65 Houses	920	60,000
SUBTOTAL			$209,000
Avg. = $209,000/65 = $3,215			
Contingencies			31,000
E&D, S&A			53,000
TOTAL Permanent Basement Closures			$293,000
Avg. $293,000/65 = $4,508			
Temporary Closures for Structures (207 Units)			
Closures	Ea. 621	775	$481,000
Sewer Valves	Ea. 207	775	160,000
Exterior Seal Coat	Ea. 207	1160	240,000
Misc.	Ea. 207	385	80,000
SUBTOTAL			$961,000
Avg. $961,000/207 = $4,643			
Contingencies			$144,000
E&D, S&A			242,000
TOTAL Temporary Structure Closures			$1,347,000
Avg. $1,347,000/207 = $6,507			
TOTAL (BASEMENTS AND STRUCTURES)			$1,640,000
Environmental Land Enhancement			$500,000
TOTAL Plan A First Cost			$2,140,000
Cost Apportionment			
Federal			
Flood Proofing (80%)			$ 1,310,000
Env. Land (75%)			380,000
Total Federal			$ 1,690,000
Non-Federal			
Flood Proofing (20%)			$ 330,000
Env. Land (25%)			$120,000
Total Non-Federal			$ 450,000

TABLE E-3

ESTIMATED FIRST COSTS 1/ 2/
PLAN B RIGHT BANK LEVEE - HOLES CREEK
WEST CARROLLTON, OHIO

Item	Unit	Quantity	Unit Price	Amount (Rounded)
Federal				
Mob and Demob	Job	1	L.S.	$10,000
Clearing and Grubbing	Job	1	L.S.	30,000
Excavation, Stripping & Blanket	C.Y.	29,700	3.00	89,000
Beautification and Landscaping	Job	1	L.S.	15,000
Excavation, Borrow	C.Y.	55,000	3.00	165,000
Excavation, Channel	C.Y.	22,800	3.00	68,000
Embankment	C.Y.	62,700	1.00	63,000
Filter Material	C.Y.	4,200	14.00	59,000
Impervious Blanket	C.Y.	17,300	5.20	90,000
Type II I-Wall	L.F.	860	370.00	318,000
Pumping Plant, with Ponding	Job	1	L.S.	900,000
Riprap	C.Y.	600	30.00	18,000
Filter Cloth	S.Y.	1,100	2.50	3,000
Seeding and Fertilizing	Acre	10	1,400.00	14,000
Ramp and Sandbag Closure	Job	1	L.S.	40,000
Contingencies				373,000
Engineering and Design				295,000
Supervision and Inspection				134,000
Overhead				66,000
Subtotal				$ 2,750,000
Mitigation Lands				$ 20,000
Estimated Federal First Cost				$ 2,770,000

TABLE E-3 (Continued) 1/ 2/

Item	Unit	Quantity	Unit Price	Amount (Rounded)
Non-Federal				
Lands and Damages				
(Incl. Acquis. & Conting.)	Job	1	L.S.	$ 1,170,000
Utilities	Job	1	L.S.	310,000
Contingencies				60,000
Engineering and Design				44,000
Supervision and Administration				36,000
Subtotal				$ 1,620,000
Mitigation Lands				10,000
Estimated Non-Federal First Cost				$ 1,630,000
Total Estimated Project First Cost				$ 4,400,000

1/ Estimate made using existing cost-sharing policy
2/ October 1979 prices and conditions

TABLE E-4

ESTIMATED FIRST COST 1/ 2/
PLAN C 25-YEAR IMPROVEMENT - HOLES CREEK
WEST CARROLLTON, OHIO

Item	Unit	Quantity	Unit Price	Amount (Rounded)
Federal				
Mob and Demob	Job	1	L.S.	$10,000
Clearing and Grubbing	Acre	4	$2,900.00	12,000
Channel Excavation	C.Y.	79,000	3.00	237,000
Material Disposal (Spoil)	C.Y.	60,000	1.60	96,000
Riprap	C.Y.	8,800	30.00	264,000
Seeding & Fertilizing	Acre	25	1,400.00	35,000
Conrail RR Bridge	Job	1	L.S.	970,000
Beautification and Landscaping	Job	1	L.S.	7,000
Filter Cloth	S.Y.	11,500	2.50	29,000
Contingencies				330,000
Engineering & Design				280,000
Supervision & Inspection				120,000
Overhead				60,000
Subtotal				$ 2,450,000
Mitigation Lands				$ 70,000
Subtotal Estimated Federal First Costs				$ 2,520,000
Non-Federal				
Lands & Damages				
(Incl. Acquis. & Conting.)	Job	1	L.S.	$870,000
Utilities, Relocation, etc.	Job	1	L.S.	230,000
Contingencies				50,000
Engineering and Design				33,000
Supervision and Administration				27,000
Subtotal				$ 1,210,000
Mitigation Lands				30,000
Estimated Non-Federal First Cost				$ 1,240,000
Total Estimated Project First Costs				$ 3,760,000

1/ Estimate based on existing cost-sharing policy
2/ October 1979 prices and conditions

REVISED 20 MAR 81

TABLE E-5

ESTIMATED FIRST COST 1/ 2/
PLAN D 500-YEAR IMPROVEMENT - HOLES CREEK
WEST CARROLLTON, OHIO

Item	Unit	Quantity	Unit Price	Amount (Rounded)
Federal				
Mob & DeMob	Job	1	L.S.	$ 12,000
Clearing and Grubbing	Acre	18	$2,900.00	52,000
Channel Excavation	C.Y.	185,000	3.00	555,000
Material Disposal (Spoil)	C.Y.	154,000	1.60	246,000
Riprap	C.Y.	11,300	30.00	339,000
Filter Cloth	S.Y.	24,000	2.50	60,000
Gabions	C.Y.	1,000	50.00	50,000
Seeding & Fertilizing	Acre	23	1,400.00	32,000
Conrail RR Bridge	Job	1	L.S.	1,390,000
Beautification and Landscaping	Job	1	L.S.	35,000
Excavation (low flow channel)	C.Y.	5,600	3.00	17,000
Riprap & Bedding (low flow channel)	C.Y.	1,100	30.00	33,000
Concrete (low flow channel)	C.Y.	80	400.00	32,000
Concrete Channel & Wall	C.Y.	680	370.00	250,000
Contingencies				617,000
Engineering & Design				480,000
Supervision & Inspection				230,000
Overhead				100,000
Subtotal				$ 4,530,000
Mitigation Lands				70,000
Estimated Federal First Cost				$ 4,600,000
Non-Federal				
Lands & Damages (Incl. Acquis. & Conting.)	Job	1	L.S.	$ 1,000,000
Utilities, Relocation, etc.	Job	1	L.S.	250,000

REVISED 20 MAR 81

TABLE E-5 (Continued)

Item	Unit	Quantity	Unit Price	Amount (Rounded)
Springboro Pike Bridge	Job	1	L.S.	$ 160,000
Contingencies				80,000
Engineering and Design				60,000
Supervision and Administration				50,000
Subtotal				$ 1,800,000
Mitigation Lands				30,000
Estimated Non-Federal First Cost				$ 1,830,000
Total Estimated Project First Costs				$ 6,430,000

1/ Estimate based on existing cost-sharing policy.
2/ October 1979 prices and conditions.

TABLE E-6

ESTIMATED FIRST COST 1/ 2/
RECREATION ELEMENT

Item	Unit	Quantity	Unit Price	Amount (Rounded)
Multi-purpose Trail	L.F.	9,000	$12.00	$108,000
Trail Alterations @ Bridges	Job	1	L.S.	30,000
Footbridge	Job	1	L.S.	100,000
Low Water Crossing	Job	1	L.S.	25,000
Picnic Shelters	Each	2	15,000.00	30,000
Water Line & Fountains	Job	1	L.S.	15,000
Walks and Play Surfaces	Job	1	L.S.	10,000
Picnic Units	Each	16	750.00	12,000
Play Equipment	Job	1	L.S.	25,000
Benches & Signs	Job	1	L.S.	2,000
Landscaping	Job	1	L.S.	6,000
Contingencies				91,000
Subtotal				$454,000
Engineering & Design, Supervision & Administration				$116,000
Real Estate for Access				30,000
Estimated Total Cost				$600,000

1/ October 1979 prices and conditions
2/ Facilities shown could change as the results of ROW acquired for the Flood Control Plan and desires of the local sponsor.

Annual Costs

Annual costs are obtained by spreading the first costs over the economic life of the project and adding estimated annual costs for operation and maintenance and major replacements. This is done by multiplying the first costs by the interest and amortization factor of 7-1/8 percent for 50 periods for plans A, C, and D. However, plan B is amortized for 100 periods. Annual costs for operation and maintenance and major replacements are estimated from historical data for similar projects. Operation and maintenance and major replacement costs for Plan A are considered insignificant; for Plan B the major costs are for mowing, pump operation, levee repairs and pump repairs; for Plans C and D the major costs are for mowing, removal of debris, sand and gravel deposits, and channel repairs. An annual charge for interest during construction is not appropriate as all plans can be constructed in less than 2 years. Annual costs for the considered plans A, B, C and D are summarized in Table E-7. Detailed annual cost estimates for the considered plans A, B, C and D are presented in Tables E-8 thru E-11.

The annual costs for the recreation elements are computed similarly. The first cost is amortized over a 50-year period using the factor for 7-1/8 percent interest rate. The annual operation and maintenance cost is based on an average cost of $0.30 per visitor day. The major replacement cost is based on the discounted cost of replacing or conducting major rehabilitation of facilities in the future. The estimated annual costs for the recreation element are shown in Table E-12.

TABLE E-7

SUMMARY OF ESTIMATED ANNUAL COSTS ($1,000)
CONSIDERED PLANS A, B, C & D
WEST CARROLLTON, OHIO

FEATURE	EXISTING COST-SHARING FEDERAL	EXISTING COST-SHARING NON-FEDERAL	EXISTING COST-SHARING TOTAL	PROPOSED COST-SHARING 1/ FEDERAL	PROPOSED COST-SHARING 1/ LOCAL	PROPOSED COST-SHARING 1/ STATE	PROPOSED COST-SHARING 1/ TOTAL
Non-structural Plan - Flood Proofing Plan A	124	33	157	118	31	8	157
Holes Creek - Right Bank Levee Plan B	198	162	360	236	108	16	360
Holes Creek - 25-Year Channel Impr. Plan C	186	126	312	208	90	14	312
Holes Creek - 500-Year Channel Impr. Plan D	339	170	509	355	130	24	509
Recreation Element 2/	22.1	48.9	71.0	19.9	48.9	2.2	71.0

1/ Proposed by President in "Remarks of the President on Water Policy," dated 6 June 1978; proposal is for each of the following to pay a set percentage of the total project cost:

Federal--------75%
Local----------20%
State---------- 5%

2/ Total cost to be shared 50-50 by Federal and Local for existing policy and 45%-5%-50% for Federal State, and Local for the President's proposal.

TABLE E-8

ESTIMATED ANNUAL COSTS 1/
PLAN A FLOOD PROOFING - HOLES CREEK
WEST CARROLLTON, OHIO

Item	Amount (Rounded)
Federal	
Interest and Amortization (1,690,000 x .073607)	$ 124,000
Non-Federal	
Interest and Amortization (450,000 x .073607)	$ 33,000
Total Estimated Annual Cost	$ 157,000

1/ Estimate made using "existing cost-sharing" policy.

TABLE E-9

ESTIMATED ANNUAL COSTS 1/ 2/
PLALN B RIGHT BANK LEVEE - HOLES CREEK
WEST CARROLLTON, OHIO

Item	Amount (Rounded)
Federal	
Interest and Amortization (2,770,000) (.071323)	$197,500
Inspection	500
Total Estimated Federal Annual Cost	$198,000
Non-Federal	
Interest and Amortization (1,630,000) (.071323)	$116,200
Operation and Maintenance	36,000
Major Replacement	9,800
Total Estimated Non-Federal Annual Cost	$162,000
Total Estimated Annual Cost	$360,000

1/ Estimate made using "existing cost-sharing" policy.
2/ 100-year project life.

TABLE E-10

ESTIMATED ANNUAL COSTS 1/
PLAN C 25-YEAR CHANNEL IMPROVEMENT - HOLES CREEK
WEST CARROLLTON, OHIO

Item	Amount (Rounded)
Federal	
Interest and Amortization (2,520,000) (.073607)	$185,500
Inspection	500
Total Estimated Federal Annual Cost	$186,000
Non-Federal	
Interest and Amortization ($1,240,000) (.073607)	$91,000
Operation, Maintenance & Major Replacements	35,000
Total Estimated Non-Federal Annual Cost	$ 126,000
Total Estimated Annual Cost	$ 312,000

1/ Estimate made using "existing cost-sharing" policy.

TABLE E-11

ESTIMATED ANNUAL COSTS 1/
PLAN D 500-YEAR CHANNEL IMPROVEMENT - HOLES CREEK
WEST CARROLLTON, OHIO

Item	Amount (Rounded)
Federal	
Interest and Amortization ($4,600,000) (.073607)	$338,600
Inspection	400
Total Estimated Federal Annual Cost	$339,000
Non-Federal	
Interest and Amortization ($1,830,000) (.073607)	$134,700
Operation, Maintenance & Major Replacements	35,300
Total Estimated Non-Federal Annual Cost	$ 170,000
Total Estimated Annual Cost	$ 509,000

1/ Estimate made using "existing cost-sharing" policy.

TABLE E-12

ESTIMATED ANNUAL COSTS 1/
RECREATION ELEMENT

Item	Amount (Rounded)
Federal	
Interest and Amortization ($300,000) (0.07361)	$22,100
Non-Federal	
Interest and Amortization ($300,000) (0.07361)	$22,100
Operation and Maintenance	19,400
Major Replacements	7,400
Total Non-Federal	$48,900
Total Estimated Annual Cost	$71,000

1/ Estimate made using "existing cost-sharing" policy.

Flood Damages

The following paragraphs discussing damages proceed from a general discussion of the nature and type of flood losses to a presentation on the determination of average annual damages. The procedures utilized in discounting and developing average equivalent values are discussed where appropriate.

Nature and Type of Flood Losses

Flood damage and loss data obtained from survey interviews and office studies were summarized by flood heights, and zero damage elevations were determined and related to synthetic gages located within each of the study reaches and ponding areas. Table E-13 describes the location of the synthetic gages and Plate E-1 shows the reaches under consideration. Elevation-damage curves were derived for all categories of property within each of the study reaches. For illustrative purposes damage curves are shown for reach HC-1 only. Curves for other reaches are on file in the Louisville District Office. The various categories of property subject to flood damages are discussed in the following paragraphs.

RESIDENTIAL

Flood damages and losses evaluated include damage to real property items such as foundations, walls, floors, heating plant, auxiliary building and grounds, and damages to contents such as furniture and personal items. This evaluation also includes estimates of costs incurred during evacuation and cleanup and rehabilitation after the flood event. Plate E-2 shows a residential damage curve for reach HC-1 for conventional flooding along the left bank of Holes Creek. Plate E-3 shows a damage curve for ponding on the left bank of Holes Creek in the area shown on Plate E-1.

TABLE E-13

LOCATION OF SYNTHETIC STREAM GAGES
HOLES CREEK AND OWL CREEK
WEST CARROLLTON, OHIO

<u>Holes Creek</u>	
HC-1	Holes Creek at mile 0.4.
HC-1 Ponding Area	At lowest point upstream of I-75 and Conrail Railroad between Owl and Holes Creeks, respectively.
HC-2	Holes Creek at mile 1.0.
HC-3	Holes Creek at mile 1.53.
HC-4	Holes Creek at mile 2.8.
<u>Owl Creek</u>	
OC-1	Owl Creek at mile 0.3.
OC-2	Owl Creek at mile 0.6.
Ponding Area	At lowest point on right bank between Conrail Railroad and Elm Street.
OC-3	Owl Creek at mile 1.01.
Ponding Area	At lowest point on right bank upstream of Elm Street.

PUBLIC

Properties evaluated in this category consist of flood damages and losses to churches and schools. Structural and content damages and cleanup costs were estimtated in a manner similar to the residential category. Plate E-4 shows a public damage curve for the reach HC-1 left bank ponding area.

COMMERICAL AND INDUSTRIAL

This category includes wholesale, retail, service, and industrial establishments. Flood damages evaluated consist of damages to structures, grounds, merchandise, and equipment. Other items evaluated include estimates of net loss of business and employee wages and costs incurred during evacuation and reoccupation. Plate E-5 shows a commercial damage curve for both banks of Holes Creek in reach HC-1.

TRANSPORTATION

Transportation damages evaluated include physical damages to roads and costs associated with traffic interruption and rerouting. Plates E-6 and E-7 show reach HC-1 curves for damages adjacent to the left bank of Holes Creek and damages within the left bank ponding area, respectively.

UTILITIES

This category consists of an evaluation of damages to electrical, telephone, natural gas, and water distribution lines and facilities. Damages were determined for each property category by estimating the numbers of users for each utility and damage per user, based on flood height. Plates E-8 and E-9 show reach HC-1 curves for damges adjacent to the left bank of Holes Creek and damages within the left bank ponding area, respectively.

Potential Damages and Character of Flood Plain Development

Flood damage estimates and evaluations in this report are based on update of data gathered during flood damage surveys conducted by this office in late 1977 and early 1978. These surveys included determination of damageable elevations, appraisal of property values, and interviews for estimates of damages for recurrence of various flood heights. Both the Holes Creek and Owl Creek flood plain areas are urbanized, including residential, commercial, industrial, public, transportation, and utility properties. Additional information regarding property values, flooding depth-damage relationships, and damage curve derivation are provided in Addendum E-1.

Table E-14 shows estimated value of property within the study reaches and as limited by the 1,000-year flood plain, and damages for recurrence of the standard project flood (SPF), 100-year flood and 10-year flood. Addendum E-2 provides a table showing number of units subject to damage by recurrence of 10, 25, 100, and 500 year flood events.

Average Annual Damages

Average annual damages (AAD) were evaluated based on both present and projected future flow conditions. Present flows refer to runoff from the Holes Creek-Owl Creek drainage areas with 1977 land use. Future flows refer to accelerated runoff with land use projected by year 2000. Plate E-10 shows the area where major land use changes are expected to occur.

Years 1977 and 2000 flow AAD were computed by integrating elevation-damage curves, discussed in the preceding paragraphs, with present and future flow elevation-flood frequency curves. Years 1979 and 1985 flow AAD were derived by straight-line interpolation between 1977 and 2000 flow AAD. Frequency curves used in this analysis are discussed and shown in the hydrologic and hydraulic appendix. Table E-15 shows estimates of years 1977, 1979, 1985, and 2000 natural average annual damages thus derived.

TABLE E-14

UNIT, VALUE AND DAMAGE FOR RECURRENCE OF SPECIFIC FLOOD HEIGHTS 1/
ALONG HOLES AND OWL CREEKS
WEST CARROLLTON, OHIO

Stream Reach and Property Category	Number of Units 2/	Property Value in $1,000 2/	Damages in $1,000 for Specific Flood Heights		
			SPF 3/	100 Years	10 Years
HOLES CREEK					
HC-1					
Residential	122	5,104.4	2,106.8	377.6	103.1
Commercial	8	4,099,1	971.0	396.3	204.2
Public	---		---	---	---
Transportation	L.S. 4/	412.2	4.6	4.2	3.9
Utilities	L.S. 4/	230.7	18.4	5.3	1.5
Total		9,846.4	3,100.8	783.4	312.7
HC-1 (Left Bank Ponding)					
Residential	28[illegible]	14,334.3	3,137.3	96.2	22.9
Commercial	---	------	----	---	---
Public	1	11,266.8	787.8	3.4	2.3
Transportation	L.S.	1,291.6	98.5	4.9	1.5
Utilities	L.S.	326.3	34.4	0.6	0.2
Total		27,219.0	4,058.0	105.1	26.9
HC-2					
Residential	265	12,659.1	2,702.2	1,072.2	515.3
Commercial	1	34.4	8.9	2.3	0.5
Public	---	-----	----	----	---
Transportation	L.S.	790.1	8.1	4.8	3.5
Utilities	L.S.	651.1	28.1	11.8	6.0
Total		14,134.7	2,747.3	1,091.1	525.3

TABLE E-14 (Continued)

Stream Reach and Property Category	Number of Units 2/	Property Value in $1,000 2/	Damages in $1,000 for Specific Flood Heights		
			SPF 3/	100 Years	10 Years
HC-3					
Residential	121	3,847.2	45.8	7.3	2.6
Commercial	---	----	----	---	---
Public	1	143.2	51.5	11.3	0.2
Transportation	L.S.	377.9	64.1	13.7	6.1
Utilities	L.S.	210.6	11.5	0.2	---
Total		4,578,9	172.9	32.5	8.9
HC-4					
Residential	8	779.8	223.3	76.0	48.7
Commercial	---	---	---	---	---
Public	---	---	---	---	---
Transportation	L.S.	68.7	8.0	3.8	1.4
Utilities	L.S.	22.0	2.0	0.2	0.1
Total		870.5	233.3	80.0	50.2
OWL CREEK					
OC-1					
Residential	117	2,174.0	721.4	581.7	27.5
Commercial and Industrial	7	12,779.3	914.3	445.6	7.4
Transportation	L.S.	377.9	38.4	32.0	23.8
Utilities	L.S.	325.0	22.4	12.7	3.2
Total		15,656.2	1,696.5	1,072.0	61.9

TABLE E-14 (Continued)

Stream Reach and Property Category	Number of Units 2/	Property Value in $1,000 2/	Damages in $1,000 for Specific Flood Heights: SPF 3/	100 Years	10 Years
OC-2 (Left Bank)					
Residential	12	409.2	36.6	23.9	2.7
Commercial	---	---	---	---	--
Public	---	---	---	---	--
Transportation	---	---	---	---	--
Utilities	---	---	---	---	--
Total		409.2	36.6	23.9	2.7
OC-2 (Right Bank Ponding)					
Residential	48	1,572.0	251.9	210.2	69.4
Commercial	---	---	---	---	---
Public	---	---	---	---	---
Transportation	L.S.	195.8	1.6	1.3	---
Utilities	L.S.	139.8	6.0	4.8	1.1
Total		1,907.6	259.5	216.3	70.5
OC-3					
Residential	105	3,501.4	423.7	362.5	326.3
Commercial	---	---	---	---	---
Public	---	---	---	---	---
Transportation	L.S.	237.0	2.4	2.3	2.2
Utilities	L.S.	62.8	8.4	6.3	5.7
Total		3,801.2	434.5	371.1	334.2

TABLE E-14 (Continued)

Stream Reach and Property Category	Number of Units 2/	Property Value in $1,000 2/	Damages in $1,000 for Specific Flood Heights		
			SPF 3/	100 Years	10 Years
OC-3 (Right Bank Ponding)					
Residential	131	5,954.0	440.8	332.6	105.5
Commercial	1	286.3	1.1	---	---
Public	---	---	---	---	---
Transportation	L.S.	904.6	9.1	---	---
Utilities	L.S.	139.0	3.7	2.5	0.6
Total		7,283.9	454.7	335.1	106.1
TOTAL STUDY AREA					
Residential	1,209	50,335.4	10,089.8	3,140.2	1,224.0
Commercial and Industrial	17	17,199.1	1,895.3	844.2	212.1
Public	2	11,410.0	839.3	14.7	2.5
Transportation	L.S. 4/	4,655.8	234.8	67.0	42.4
Utilities	L.S. 4/	2,107.3	134.9	44.4	18.4
TOTAL		85,707.6	13,194.1	4,110.5	1,499.4

1/ October 1979 values.
2/ From recurrence of 1,000-year flood.
3/ Represents SPF, except that damages for Owl Creek are for 1,000-year flood (SPF has not been defined).
4/ L.S. means lump sum. These categories include damages not measurable in physical units.

TABLE E-15

AVERAGE ANNUAL DAMAGES ($1,000) 1/
AT 7-1/8 PERCENT INTEREST RATE
WEST CARROLLTON, OHIO

Stream and Reach	Average Annual Damages 1977 Flows (1)	1979 Flows 2/ (2)	1985 Flows 2/ (3)	2000 Flows (4)	1985-2035 Flow AAE Damages (5)	AAE Affluence Damages 3/ (6)	Total Damages 4/ (7)
Holes Creek							
HC-1 (Right Bank)	55.3	57.7	64.9	82.9	11.6	0.0	76.5
HC-1 (Left Bank)	51.9	54.4	61.8	80.4	12.0	11.5	85.3
HC-1 (Left Bank Ponding)	26.9	28.4	32.7	43.6	7.0	8.8	48.5
HC-2 (Both Banks)	221.4	236.9 5/	283.2 5/	394.4 5/	71.7 5/	73.7 5/	428.6
HC-3 (Both Banks)	3.4	4.8 5/	9.1 5/	20.4 5/	7.3 5/	3.4 5/	19.8
HC-4 (Both Banks)	10.6	11.4	13.7	19.4	3.7	5.3	22.7
Total Holes Creek	369.5	393.6	465.4	641.1	113.3	102.7	681.4
Owl Creek							
OC-1 (Right Bank)	46.0	47.4	51.7	62.3	6.8	3.7	62.2
OC-2 (Right Bank Ponding)	30.2	30.9	33.0	38.2	3.4	4.9	41.3
OC-2 (Left Bank)	1.9	1.9	2.0	2.3	0.3	0.3	2.6
OC-3 (Right Bank Ponding)	29.8	31.1	35.1	45.0	6.5	9.2	50.8
OC-3 (Left Bank)	44.9	46.8	52.6	67.1	9.5	13.8	75.9
Total Owl Creek	152.8	158.1	174.4	214.9	26.5	31.9	232.8

1/ October 1979 values.
2/ Derived by straight-line interpolation between 1977 and 2000 flow AAD.
3/ Affluence as discussed in this Appendix.
4/ Column (3) + (5) + (6).
5/ Includes damages to projected new residential and commercial development, which is discussed in future development benefits paragraphs.

Average annual equivalent damages were also developed in this table in order to display expected residual damages with certain plans in place. These values were developed using the same general procedure as used for developing the average annual equivalent benefits, as discussed in the following paragraphs. Undiscounted average annual damages are displayed by 10-year intervals in Table E-16.

Benefits for Plans B, C, and D

The considered improvement plans evaluated, which were previously discussed in the report, are described briefly as follows.

Plan B - SPF R/B Levee from I-75 Ramp to about Lamme Road.

Plan C - 25-Year Channel Improvement from I-75 Ramp to Lamme Road with Conrail Bridge replaced.

Plan D - 500-Year Channel Improvement from I-75 to 1,000 feet upstream of Lamme Road with Conrail Bridge replaced.

Flow Benefits

Flow benefits were evaluated based on flow conditions for years 1977, 1979, 1985, and 2000. Flow benefits credited to the considered improvement plans were computed as the difference between average annual flood damages without and with the plan. The without (natural) and with (modified) average annual damage estimates were derived by integrating the damage curves with natural and modified present and future flow frequency curves. A frequency composite damage curve for present and future flows and as modified by Plan D for reach HC-1 is shown on Plate E-11. Frequency curves are discussed in the hydrologic section. Average annual flow benefits credited to the considered plans are shown as part of Table E-17. Columns (1) and (4) of this table show

TABLE E-16

AVERAGE ANNUAL DAMAGES ($1,000) 1/
BY 10-YEAR INTERVALS (UNDISCOUNTED)
WEST CARROLLTON, OHIO

Item	1979	1985 2/	1995	2005	2015	2025	2035
Flow Damages							
Holes Creek	394	465	583	641	641	641	641
Owl Creek	158	174	202	215	215	215	215
Total	552	639	785	856	856	856	856
Affluence Damages							
Holes Creek	12	52	121	140	140	140	140
Owl Creek	5	15	37	46	46	46	46
Total	17	67	158	186	186	186	186
Total Damages							
Holes Creek	406	517	704	781	781	781	781
Owl Creek	163	189	239	261	261	261	261
Total	569	706	943	1042	1042	1042	1042

1/ Without project, October 1979 values
2/ Base Year

benefits based on 1977 and 2000 flow conditions. Column (2) shows benefits for 1979 flows interpolated from 1977 and 2000 flow benefits. Column (3) of this table shows benefits for the projected first year of completion (1985) of the considered alternative plans. The base year 1985 estimates, the year in which a plan could be implemented, were derived by straight line interpolation between 1977 and 2000 flow benefits. Column (5) of this table shows discounted 1985 to 2035 average annual equivalent (AAE) flow benefits. Column (6) shows a total of 1985 (base year) and 1985-2035 AAE flow benefits.

Future Development Benefits

Open areas along Holes Creek were investigated in February 1979 to determine likely future use. While five areas were investigated, only two areas were considered significant for evaluation. These areas are shown as Sites 1 and 2 on Figure E-1. Both sites are currently owned and operated by Siebenthaler Nursery. Based on information obtained from planning officials of the Miami Township, local real estate companies, and observing recent residential construction in the areas, it is predicted that these areas will likely be converted to residential and commercial use by 1985, irregardless of flood control project construction. Addendum E-3 provides additional discussion and support for this prediction. On this basis location benefit methodology is considered inappropriate. Future growth benefits were evaluated in these areas, assuming that National Flood Insurance requirements are met.

Site 1 contains about 145 acres with 121 acres zoned multifamily residential and 24 acres zoned commercial. All of the commercial zoned acres and all but 27 acres of the multifamily zoned acres lie above the present natural 100-year flood plain. However, multifamily development planned on the 27 acres will be built on concrete foundations with first floors elevated above the 100-year flood. Plans indicate about 14.5 family units will be build per acre at an average cost of $36,000 per unit.

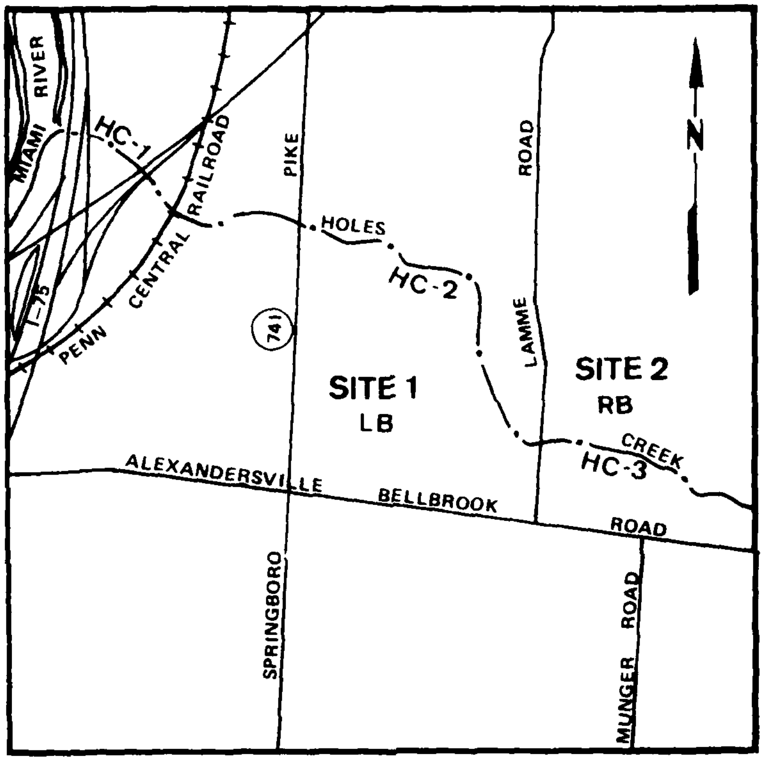


FIGURE E-1: FUTURE DEVELOPMENT SITES

Site 2 contains about 92 acres zoned single family residential, with about 14 of these acres located below the 100-year flood plain. First floors of buildings on these 14 acres will be elevated above the 100-year flood in a manner similar to the multifamily construction described for Site 1. Plans indicate 2.9 single family units will be built per acre at an average cost of $60,000 per unit.

Elevation area curves were developed from 2-foot contour maps covering the areas between the present natural 100-year and SPF flood levels. Area curve data were related to value-depth-damage data for the planned construction discussed in the preceding paragraphs to develop elevation damage curves. Damage curve data were related to 1977 and 2000 flow natural and modified frequency data to derive 1977 and 2000 flow average annual benefits. As mentioned previously, these areas are considered likely to be developed by 1985. On this basis, future growth benefits were determined for 1979 and 1985 by straight-line interpolation between 1977 and 2000 flow benefits. Table E-17 includes projected future growth average annual benefits applicable to the considered flood control plans.

Affluence Benefits

Affluence benefits to existing and future residential property contents were evaluated based on per capita income projected by OBERS for BEA Economic Area 063, the area in which the study area is located. The affluence projections were carried out to the year in which the value of contents equate to 75 percent of the value of the residential structure with no increase thereafter. Columns (7) of Table E-17 shows affluence benefits to existing and projected future residential development applicable to the considered flood control plans.

Total Flood Control Benefits

Column (8) of Table E-17 shows total flood control benefits credited to the considered flood control plans. Undiscounted average annual benefits for Plan D are displayed by 10-year intervals in Table E-18. Undiscounted

TABLE E-17

FLOOD CONTROL BENEFITS ($1,000) 1/
AT 7-1/8 PERCENT INTEREST RATE
WEST CARROLLTON, OHIO

Stream, Plan and Reach	1977 Flow Benefits (1)	1979 Flow Benefits 2/ (2)	1985 Flow Benefits 2/ (3)	2000 Flow Benefits 3/ (4)	1985-2035 AAF Flow Benefits 4/ (5)	Total Flow Benefits 5/ (6)	AAE Affluence Benefits 6/ (7)	Total Benefits 7/ (8)
Holes Creek								
25-Year Channel Improvement (Plan C)								
HC-1 (Right Bank)	49.6	51.2	56.2	68.2	7.8	64.0	0.0	64.0
HC-1 (Left Bank)	46.5	48.3	53.6	67.0	8.5	62.1	9.2	71.3
HC-1 (Left Bank Ponding Area)	3.1	4.5	8.7	19.1	6.6	15.3	4.3	19.6
HC-2 (Right Bank)	212.1	221.4	249.4	319.4	44.4	293.8	68.3	362.1
HC-2 (Left Bank) 8/	0.0	5.6	22.4	59.7	23.6	46.0	2.7	48.7
HC-3 (Right Bank) 8/	0.0	0.9	3.4	8.7	3.4	6.8	0.4	7.2
Total	311.3	331.9	393.7	542.4	94.3	488.0	84.9	572.9
500-Year Channel Improvement (Plan D)								
HC-1 (Right Bank)	53.1	55.3	61.9	78.4	10.5	72.4	0.0	72.4
HC-1 (Left Bank)	49.9	52.2	59.1	76.4	11.0	70.1	11.0	81.1
HC-1 (Left Bank Ponding Area)	3.1	4.5	8.7	19.2	6.7	15.4	4.3	19.7
HC-2 (Right Bank)	218.7	228.2	256.9	328.4	45.3	302.2	69.5	371.7
HC-2 (Left Bank) 8/	0.0	5.6	22.4	59.7	23.6	46.0	2.7	48.7
HC-3 (Right Bank) 8/	0.0	1.2	4.9	12.6	4.9	9.8	1.4	11.2
HC-3 (Left Bank) 8/	3.4	3.6	4.2	5.8	1.0	5.2	1.6	6.8
Total	328.2	350.6	418.1	580.5	103.0	521.1	90.5	611.6
Right Bank Levee and Channel Realignment (Plan B)								
HC-1 (Right Bank)	55.3	57.7	64.9	82.9	11.6	76.5	0.0	76.5
HC-2 (Right Bank)	221.4	231.3	260.8	334.7	47.6	308.4	71.0	379.4
Total	276.7	289.0	325.7	417.6	59.2	384.9	71.0	455.9

1/ October 1979 values.
2/ Derived by straight-line interpolation between 1977 and 2000 flows. 1985 is the considered first year of project operation (Base Year).
3/ Projected year of urbanization of drainage area (basis of future flow frequency curves).
4/ Average annual equivalent (AAE) benefits based on discounting of incremental increase from 1985 to 2000 based on 7-1/8% with 50 year life for channel improvement projects and 100-year life for levee plan (50-year factor = 0.63362; 100-year factor = 0.64449).
5/ Column (3) + (5).
6/ Projected affluence increase in residential contents damageable values, limited to 75 percent of residential structures damageable values, based on per capita income projections by OBERS for BEA 063.
7/ Column (6) + (7) + (8) + (9).
8/ Benefits to projected new residential and commercial development irrespective of project construction.

TABLE E-18

PLAN D AVERAGE ANNUAL BENEFITS ($1,000) 1/
BY 10-YEAR INTERVALS (UNDISCOUNTED)
WEST CARROLLTON, OHIO

Item	1979	1985 2/	1995	2005	2015	2025	2035
Flow Benefits							
Holes Creek	351	418	526	581	581	581	581
Affluence Benefits							
Holes Creek	11	45	109	126	126	126	126
Total Benefits							
Holes Creek	362	463	635	707	707	707	707

1/ October 1979 Values
2/ Base Year

residual average annual damages with Plan D are displayed by 10-year intervals in Table E-19.

Advance Replacement of Bridge

Construction of the proposed plan requires replacement of the Conrail Railroad bridge located in the lower portion of Holes Creek. This bridge has an estimated remaining useful life of 20 years, or 15 years from 1985, the base years for project evaluation. The advanced replacement of this bridge will earn benefits for the project equal to the annual costs accruing during the remaining project life after adjustment for the remaining life of the existing bridge. The annual benefits are derived by discounting the bridge cost, which would occur at year 2000 in the absence of the project, back to 1985 (base year for evaluation) and then amortization the savings over the project life. The benefits derived from this procedure are shown in Table E-20.

National Flood Insurance Program

All of the flood protection plans would eliminate the need for flood insurance on some homes in the study area. The savings in cost of administering flood insurance policies is a benefit to the proposed plan. Based on information obtained from FIA, these costs amount to about $29 per policy. Benefits derived by the above procedure are shown in Table E-20 for the four plans.

Total Benefits

Table E-21 summarizes for Plans B, C, and D average annual equivalent flood control benefits from Table E-17, and bridge replacement benefits and flood insurance administrative costs savings from Table E-20.

TABLE E-19

RESIDUAL AVERAGE ANNUAL DAMAGES ($1,000) 1/
BY 10-YEAR INTERVALS (UNDISCOUNTED)
WEST CARROLLTON, OHIO

Item	1979	1985 2/	1995	2005	2015	2025	2035
Flow Damages							
Holes Creek	43	47	57	60	60	60	60
Affluence Damages							
Holes Creek	1	7	12	14	14	14	14
Total Damages							
Holes Creek	44	54	69	74	74	74	74

1/ With Plan D, October 1979 Values
2/ Base Year

TABLE E-20

BENEFITS RESULTING FROM ADMINISTRATIVE
SAVINGS TO THE NATIONAL FLOOD INSURANCE PROGRAM
AND FROM THE ADVANCE REPLACEMENT OF A RAILROAD BRIDGE

SAVINGS OF ADMINISTRATIVE COSTS FOR FIA PROGRAM

Plan	Houses Protected (100-yr. flood plain)	Average Savings	Annual Benefits (Rounded)
A	272	$29	$8,000
B	196	$29	$6,000
C	Est. 235	$29	$7,000
D	300	$29	$9,000

BENEFITS FOR ADVANCE REPLACEMENT OF RAILROAD BRIDGE

Plan	Bridge Replacement Cost	Annual Benefits 1/ (Rounded)
C	$1,430,000	$35,000
D	$1,980,000	$49,000

1/ Annual Benefits at 7-1/8% derived as follows:

First Cost x Interest and Amortization (0.073607) x Present Worth of 1 per year for 35 years
(12.773156) x Present Worth of 1 for 15 years (0.356154) x Interest and Amortization
(0.073607) = Annual Benefits

TABLE E-21

SUMMARY OF AVERAGE ANNUAL BENEFITS ($1,000) 1/
AT 7-1/8 PERCENT INTEREST RATE
WEST CARROLLTON, OHIO

	Total AAE Flood Control Benefits	FIA Benefits	Bridge Replacement Benefits	Total AAED
Holes Creek				
Plan B: Right Bank SPF Levee	456	6	-	462
Plan C: 25-Year Channel Improvement	573	7	35	615
Plan D: 500-Year Channel Improvement	612	9	49	670

1/ October 1979 values.

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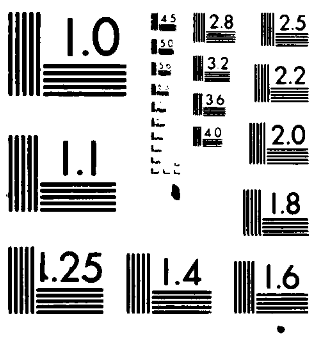


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

Benefits for Plan A

Benefits for the flood proofing plan were derived similarly as for the structural plans. Flow benefits were derived in same manner as previously discussed As the plan does not actually reduce flood conditions, no future development benefits were claimed. Affluence benefits to existing development were evaluated as previously described. Benefits derived from eliminating the need for flood insurance were also evaluated as previously described. Table E-22 summarizes the benefits for the flood proofing plan.

Residual Damages

With any of the plans in effect some flood damages would still occur. The damages would result from either floods occurring greater than the degree of protection furnished or areas unprotected by the plan. The residual average annual damages for the four plans are shown below:

Plan A - $304,000
Plan B - $225,000
Plan C - $108,000
Plan D - $ 70,000

Plan D eliminates most of the average annual damages of the area and greatly reduces the Standard Project Flood. The occurrence of SPF under present condition would cause damages on the four study reaches for Holes Creek of about $10,300,000. With Plan D in place these damages would be reduced to about $1,800,000.

Economic Justification for Flood Control Plans

A comparison of the estimated average annual costs and benefits and resultant benefit to cost ratios are provided in Table E-23. As previously stated, an interest rate of 7-1/8 percent was used in determining average

TABLE E-22

SUMMARY OF BENEFITS FOR PLAN A

Stream Reach	Total No. of Res. Units	No. of Units to be Protected			Estimated Average Annual Damages 1/ (1,000)			Estimated Average Annual Benefits (1,000)			Total Benefits w/FIA
		Bsmts 2/	1st Floor3/	Total	Bsmts	1st Floor	Total	Bsmts	1st Floor	Total	
HC-1	78	26	39	65	$ 57	$ 14	$ 71	$ 38	$ 14	$ 52	
HC-1P	26	14	5	19	12	20	32	8	20	28	
HC-2	196	25	158	183	47	244	291	32	244	276	
HC-3	1	-	1	1	-	2	2	-	2	2	
HC-4	4	-	4	4	-	19	19	-	19	19	
Total	305	65	207	272	$116	$299	$415	$ 78	$299	$377	$385

1/ Average annual damages and resulting benefits are derived for flood conditions up to and including the 100-year flood.

2/ Number of units subject to basement flooding reflects a 1/3 reduction to account for homes with basement garages, which are not considered flood proofable.

3/ All units with flooding at first floor and above are considered flood proofable.

TABLE E-23

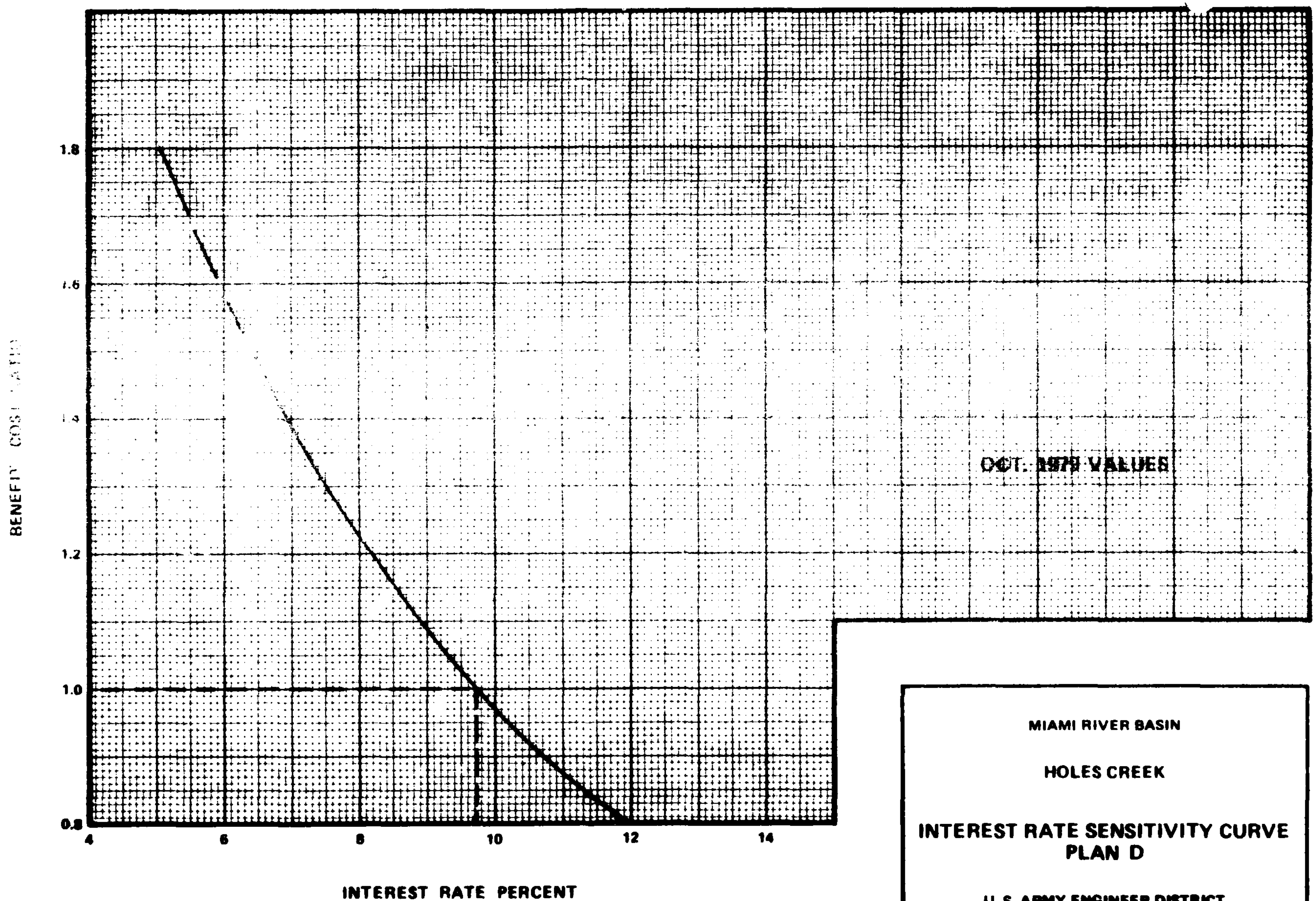
SUMMARY OF FIRST COSTS, ANNUAL COSTS, ANNUAL BENEFITS
BENEFIT TO COST RATIO, AND NET BENEFITS FOR CONSIDERED PLANS
FOR HOLES CREEK, WEST CARROLLTON, OHIO

Considered Plans	First Costs ($1,000)	Annual Costs ($1,000)	Annual Benefits ($1,000)	Benefits/ Cost Ratio	Net Benefits ($1,000)
Plan A: Non-structural, Flood Proofing	2,140	157	385	2.5	228
Plan B: Right Bank Levee	4,400	360	462	1.3	102
Plan C: 25-year Channel Improvement	3,760	312	615	2.0	303
Plan D: 500-year Channel Improvement w/o Rec	6,430	509	670	1.3	161
" " " " w/Rec	7,030	580	754	1.3	174

annual costs and benefits. Addendum E-4 provides detailed economic feasibility for Plan D based on October 1979 and October 1980 values at 7-1/8 percent and 7-3/8 percent interest rates, respectively. Since the interest rate for non-Federal financing is usually higher than this rate and historically the Federal rate has increased yearly, an indication of the sensitivity of economic justification is appropriate. Although the sensitivity would vary with each plan, the tentatively selected plan, Plan D, was evaluated and the results are shown on Figure E-2. This plan would become economically infeasible when the interest rate reaches about 9-3/4 percent if all other factors remained the same. As the maximum increase in the discount rate used by the Federal Government is 1/4 of 1 percent for any year (Chapter IV, D.,"The Discount Rate" in the "Standards for Planning Water and Related Land Resources" of the Water Resources Council, as amended (39 FR29242)), the plan would remain economically feasible for about the next 10 years, if all other factors remained relative.

Other economic feasibility checks performed include determination of the B/C ratio of base year development and the project year that undiscounted benefits exceed annual charges. Based on year 1985 flood control benefits of $463,000 (from Table E-18) and FIA administrative cost savings of $9,000 and annual charges of $509,000, the B/C ratio applicable to base year development is 0.93 for Plan D without recreation. Figure E-3 shows an undiscounted benefit curve (from Table E-18 plus $9,000 FIA savings). This curve indicates undiscounted benefits will exceed annual costs by 1987 or the second year after implementation of Plan D. Addendum E-4 shows the economic feasibility without future flood plain development and future affluence, and Addendum E-5 shows the economic feasibility assuming urbanization of the drainage area by year 1990.

Maximum net tangible benefits identifies the plan with the greatest excess of benefits over cost. Of the four detailed plans, Plan C had the largest net benefits. To determine the scale of the plan that optimizes net benefits for the channel improvement alternative, a graph of net benefits versus scale was plotted and is shown on Figure E-4. The graph indicates that the channel improvement plan maximizing net benefits would be one designed for about a 25-year frequency flood.



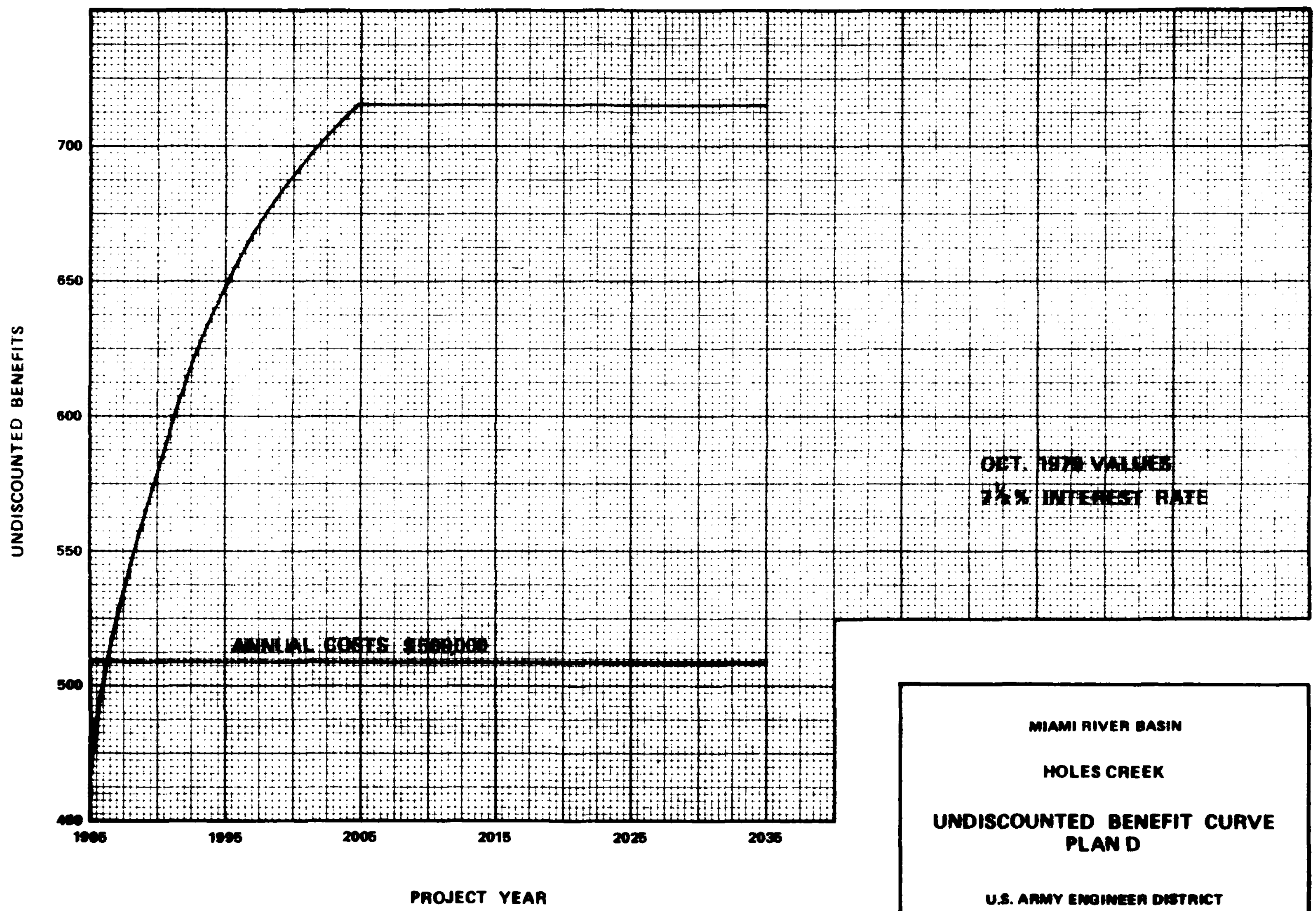
MIAMI RIVER BASIN

HOLES CREEK

INTEREST RATE SENSITIVITY CURVE
PLAN D

U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLPD–E SEPTEMBER 1980

FIGURE E–2



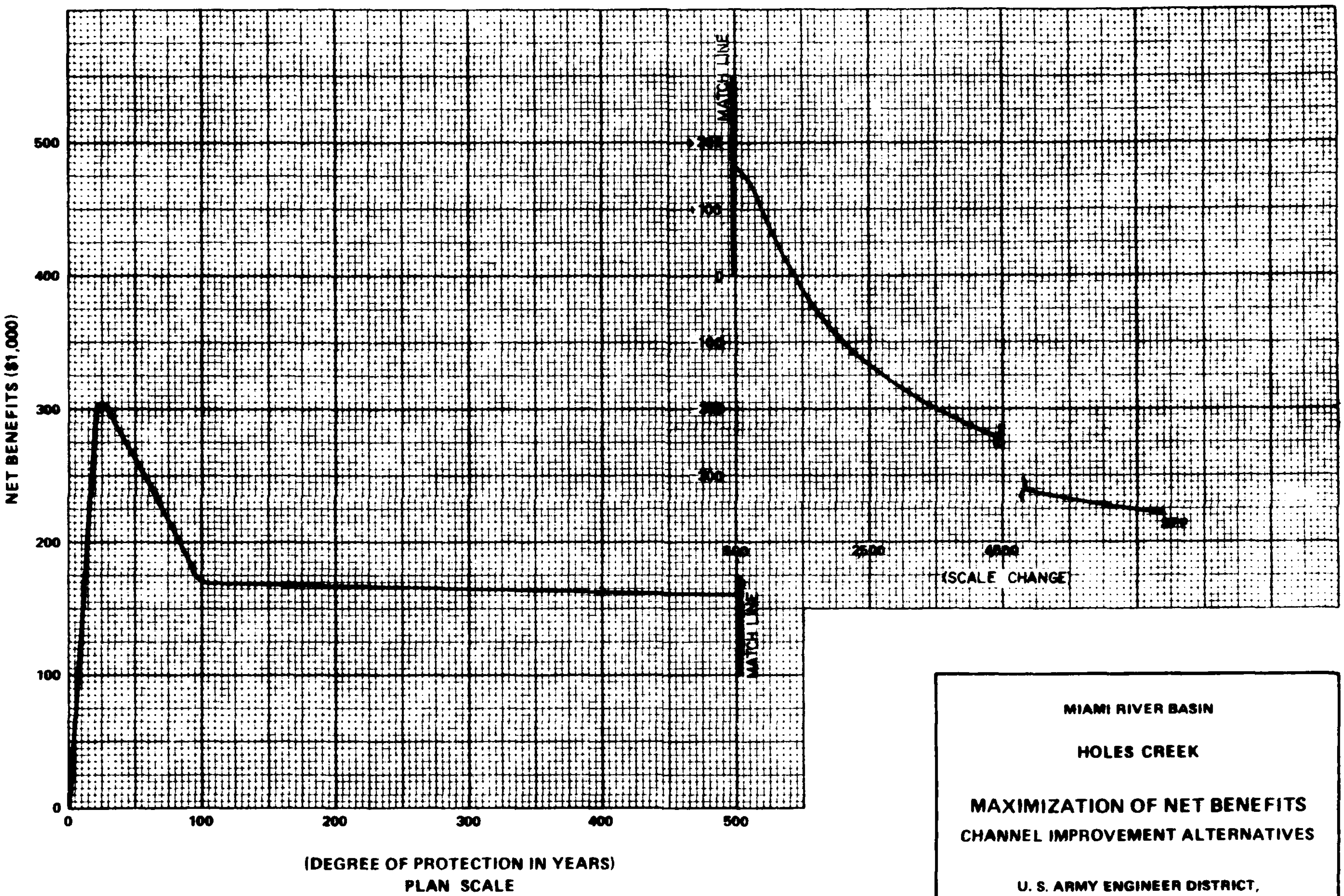
MIAMI RIVER BASIN

HOLES CREEK

UNDISCOUNTED BENEFIT CURVE
PLAN D

U.S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLPD-E SEPTEMBER 1980

FIGURE E-3



MIAMI RIVER BASIN

HOLES CREEK

MAXIMIZATION OF NET BENEFITS

CHANNEL IMPROVEMENT ALTERNATIVES

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD–E SEPTEMBER 1980

REV 20 MAR 81
FIGURE E-4

Recreation Evaluation

The recreation market area for the recreation development has been limited to the adjacent neighborhood areas accessible by foot and bicycle. This area is roughly bounded by Alexandersville-Bellbrook Road to the south, I-75 to the west, West Stroop Road to the north, and the golf course to the east. It is estimated that approximately 6,000 people live within this zone. The existing recreation facilities in the are include a golf course and playgrounds associated with a small park and public schools. Current recreational usage of the creek consists mainly of use by neighborhood children for a playground and possibly limited fishing.

Determination of Recreation Demand

Recreational demands in and around large urban areas are generally high. The Dayton-West Carrollton area is no different. The recreation development considered is relatively small scale and consequently does not have the potential to satisfy regional demands. It does offer the potential to satisfy part of the recrational demands that exist in the surrounding neighborhoods. By maintaining the development as a limited-use neighborhood park, the initial saturation of the facilities by the conterminous population will preclude future over utilization of the resources.

Following is an estimated annual recreation day usage based on the kinds of facilities that would be compatible with this type of development and the estimate of 6,000 persons living within the zone of influence. The percent of participation and the number of days/participation have been taken from the 1970 Survey of Outdoor Recreation Activities, Bureau of Outdoor Recreation.

Activity	Population	x	Percent Participation	x	Number of Days/ Participation	=	Annual Recreation Days
Outdoor Games	6,000	x	39.1	x	45.1	=	105,805
Picnicking	6,000	x	51.7	x	6.7	=	20,783
Walking/Jogging	6,000	x	32.6	x	37.3	=	72,959
Bicycling	6,000	x	23.3	x	48.6	=	67,943
					TOTAL		267,490

NOTE: These figures are based on the 1970 usage from the above report. Since then, leisure time has increased. This would currently reflect a larger number of days/participation. Also, there has been a significant increase in bicycling and jogging. For these reasons, this estimate is considered conservative.

From the above computations, usage by the 6,000 people within the zone of influence could approximate 267,500 annual recreation days, assuming adequate lands and facilities were available. Following is a determination of the potential annual use by activity unit.

ANNUAL USE BY ACTIVITY EQUATION

$U = C\frac{(N)(T)}{(Y)(PWV)} =$ Annual Use per Activity

Where: C = Carrying Capacity per unit per activity (derived from study by Heritage Conservation and Recreation Service).
N = Number of weeks in recreation season per activity.
T = Daily Turnover per activity.
Y = Percent of annual use in recreation season.
PWV = Percent of weekly use on weekend day.

Applying the above equation for the four activities provided for by the planned recreation development results in the following determination of annual use.

Outdoor Games:

C = 60 people/acre; N = 30; T = 2; Y = 80%; PWV = 25%

U/Acre = $60\ \frac{30x2}{.80x.25} =$ 18,000 activity days/acre

Picnicking:

C = 25 tables/acre x 4 people/table
= 100 people/acre
N = 18; T = 2; Y = 80%; PWV = 30%

U/Acre = $100\ \frac{18x2}{.8x.3} =$ 15,000 activity days per acre

Walking & Jogging:

C = 50 people/mile; Y = 80%; PWV = 25%; N = 30; T = 3

$$U/Mile = 50 \frac{30x3}{.8x.25} = 22,500 \text{ activity days per mile}$$

Bicycling:

C = 25 per mile per lane; N = 30; T = 4; Y = 80%; PWV = 25%

$$U/Mile = 25 \frac{30x4}{.8x.25} = 15,000 \text{ activity days per mile}$$

As previously stated, facilities are provided for day-use activites consisting of walking, jogging, bicycling, outdoor games and picnicking. The trail system includes about 9,000 feet of 8-foot asphalt trail with one low water crossing and one footbridge. It is estimated that about 2 acres of project lands, consisting of 3 sites, will be available for recreation development. Approximately 1.4 acres will be used for outdoor games and the remaining 0.6 acres for picnicking. Using the annual activity days per unit developed in the preceding section, the expected activity days and visitor days can be computed.

Expected Activity Days

Activity	Facility Units	Annual Activity Days per Unit	Activity Days
Walking & Jogging	1.7 miles	22,500/mile	38,000
Bicycling	1.7 miles	15,000/mile	25,000
Outdoor Games	1.4 acres	18,000/acre	25,000
Picnicking	0.6 acres	15,000/acre	9,000
			97,000

To obtain visitor days from activity days it was assumed that 1.5 activity days equal one visitor day. This results in the recreation development providing opportunities for 64,700 visitor days. This is the projected use of the development as demand is higher than supply in all activities.

Economics

The first and annual costs for developing the recreation element are presented in Tables E-6 and E-12, respectively. The total average annual cost was estimated to be $71,000. The range of benefits are to some extent dependent on the cumulative development in the surrounding communities and in the Miami River valley. Recreation benefits are estimated at $1.30/visitor day. This dollar amount would yield an annual visitation dollar benefit of $84,000. The resulting benefit to cost ratio is 1.2.

Economics Of Selected Plan

The selected plan consists of Plan D with the recreation element added. Using previously derived data, the benefit to cost ratio can be shown. This ratio and appropriate costs and benefits for the selected plan are shown in Table E-24.

TABLE E-24

ECONOMIC SUMMARY
SELECTED PLAN

Purpose	Total First Cost	Average Annual Cost	Average Annual Benefits	Net Benefits	Benefit To Cost Ratio
Flood Control	$6,430,000	$509,000	$670,000	$161,000	1.3
Recreation	600,000	71,000	84,000	13,000	1.2
Selected Plan	$7,030,000	$580,000	$754,000	$174,000	1.3

... shows that 1.5 ... reduction ... This is the ... supplies to all ...

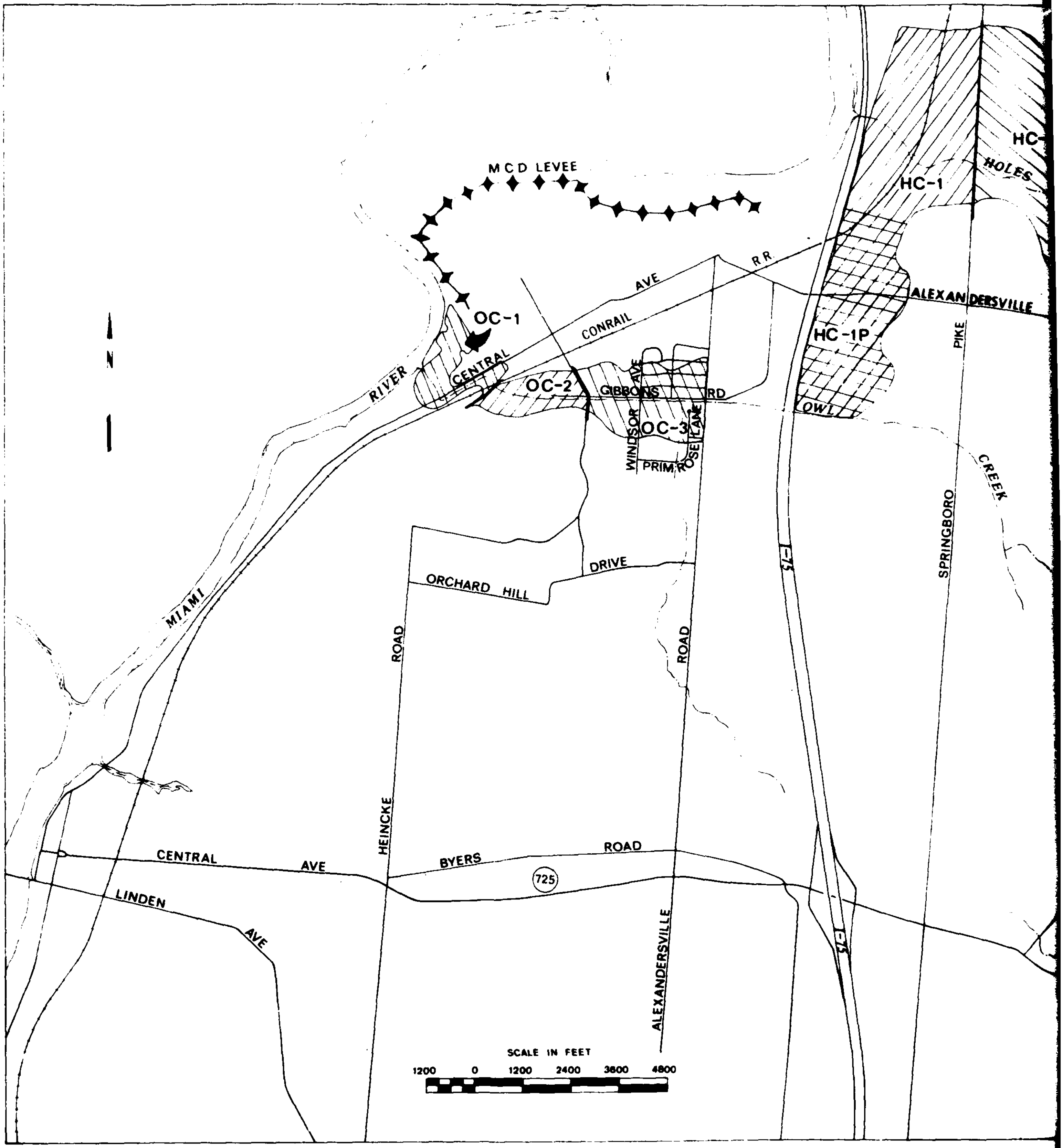
Economics

... waste element are presented ... total average annual cost was ... to some extent ... monetaries and in ... $1.30/visitor day. This ... dollar benefit of $84,000 ...

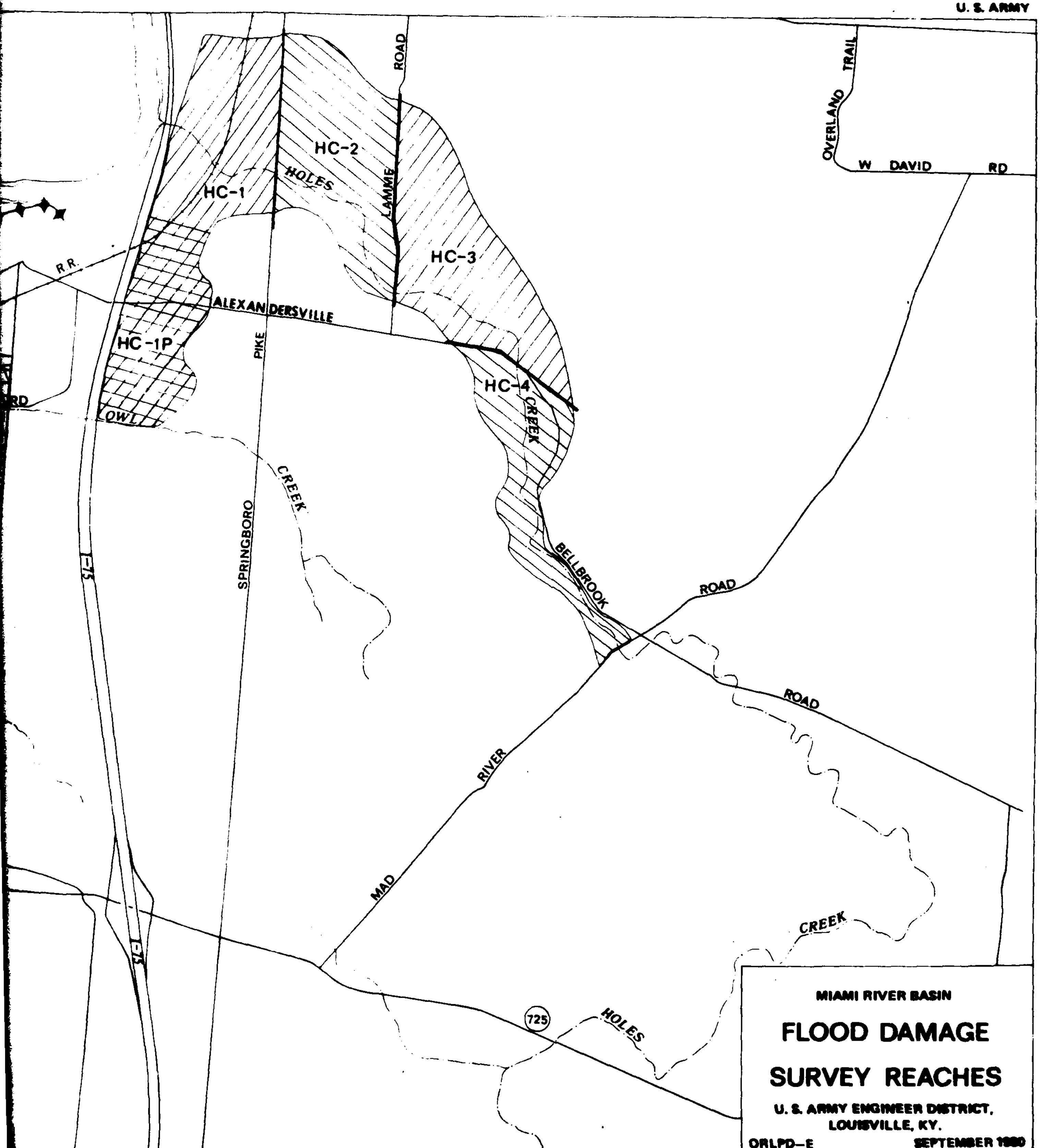
Economics Of Selected Plan

... elements added ... shown. This ... are shown in Table ...

Purpose	[illegible]	[illegible]	Net Benefits	Benefit To Cost Ratio
Flood Control	[illegible]	[illegible]	$161,000	1.2
Recreation	[illegible]	[illegible]	13,000	1.2
Selected Plan	[illegible]	[illegible]	$174,000	1.3


M C D LEVEE
OC-1
OC-2
OC-3
HC-1
HC-1P
HC-
HOLES
CREEK
OWL
RIVER
MIAMI
CENTRAL
AVE
CONRAIL
RR
ALEXANDERSVILLE
GIBBONS
RD
AVE
WINDSOR
PRIMROSE
LANE
DRIVE
ORCHARD HILL
ROAD
HEINCKE
ROAD
I-75
SPRINGBORO
PIKE
CENTRAL
AVE
BYERS
ROAD
725
LINDEN
AVE
ALEXANDERSVILLE
N
SCALE IN FEET
1200
0
1200
2400
3600
4800

U. S. ARMY



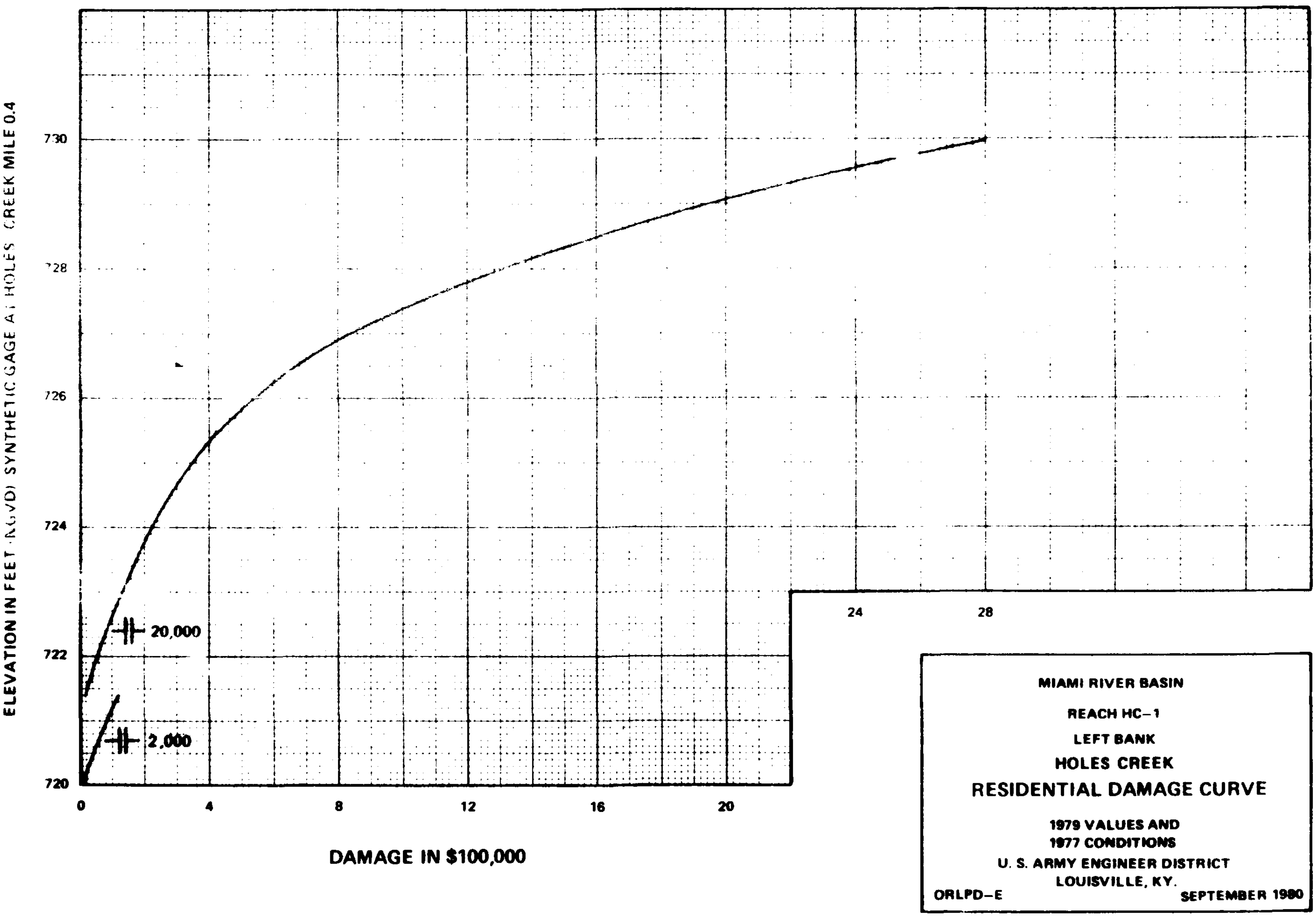
MIAMI RIVER BASIN

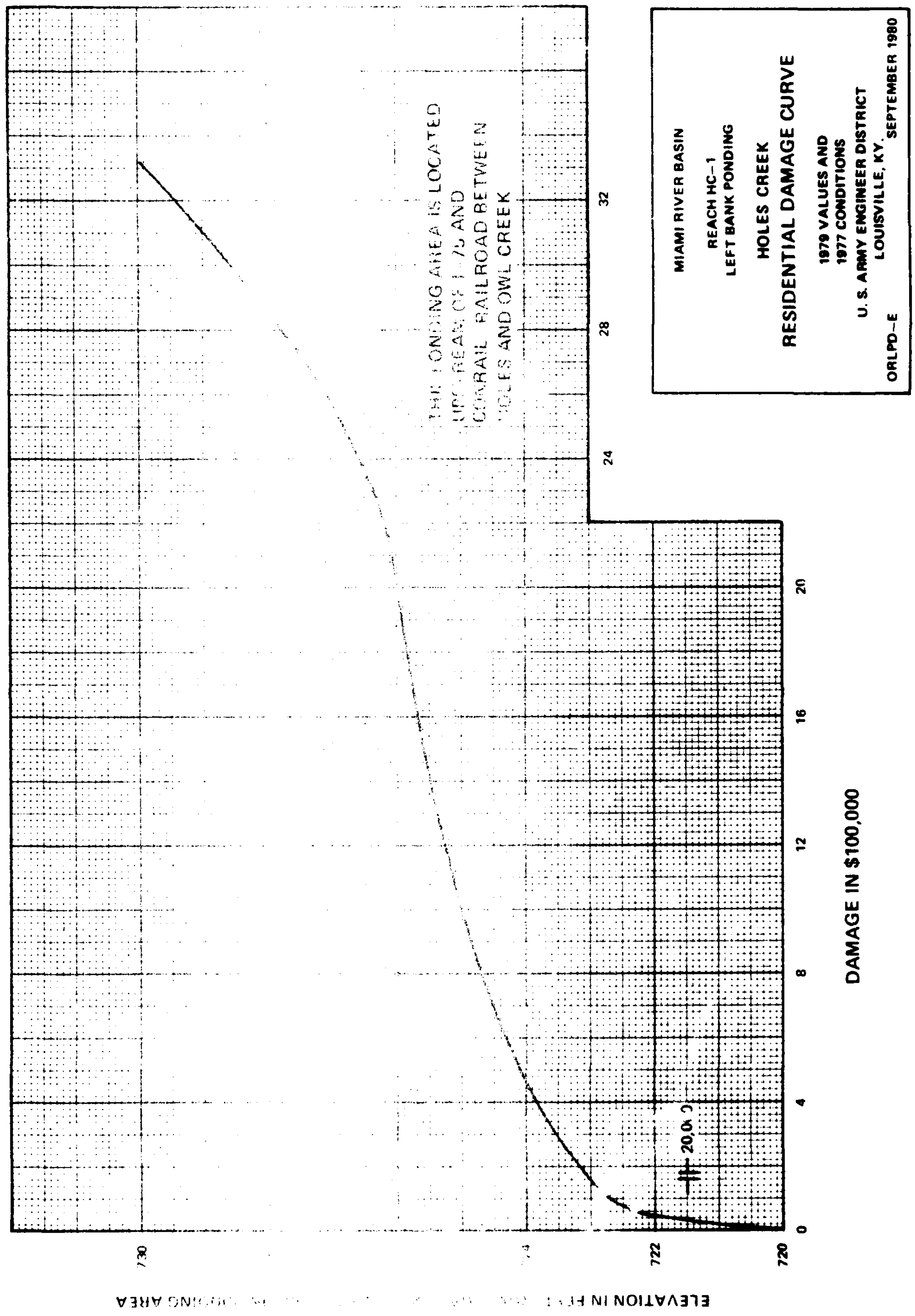
FLOOD DAMAGE SURVEY REACHES

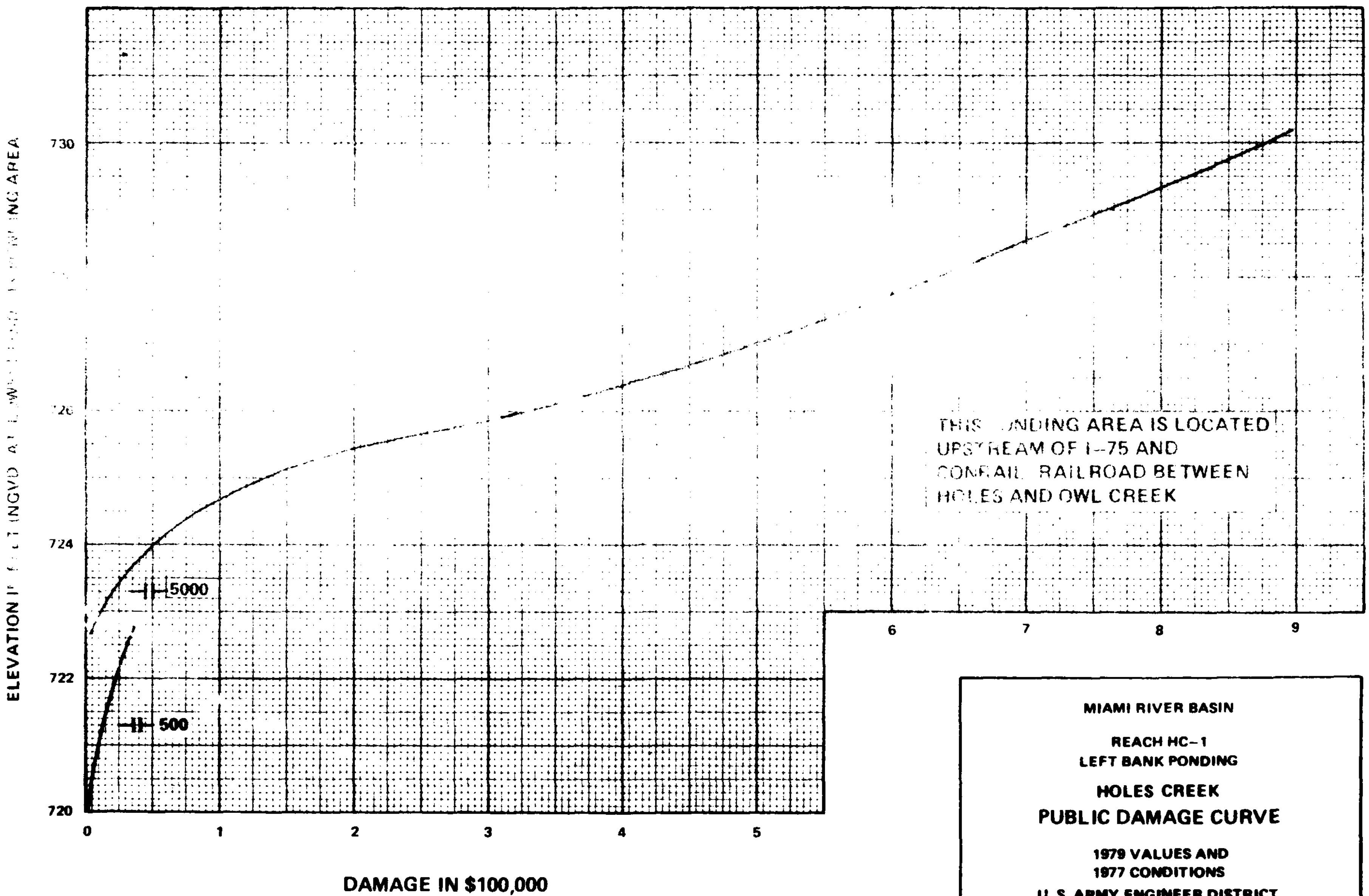
U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD-E SEPTEMBER 1980

APPENDIX E PLATE E-1


ELEVATION IN FEET (NGVD) SYNTHETIC GAGE AT HOLES CREEK MILE 0.4
730
728
726
724
722
720
0
4
8
12
16
20
24
28
DAMAGE IN $100,000
20,000
2,000
MIAMI RIVER BASIN
REACH HC–1
LEFT BANK
HOLES CREEK
RESIDENTIAL DAMAGE CURVE
1979 VALUES AND
1977 CONDITIONS
U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLPD–E
SEPTEMBER 1980


MIAMI RIVER BASIN
REACH HC-1
LEFT BANK PONDING
HOLES CREEK
RESIDENTIAL DAMAGE CURVE
1979 VALUES AND
1977 CONDITIONS
U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLPD-E
SEPTEMBER 1980
THE PONDING AREA IS LOCATED
UPSTREAM OF I-75 AND
CONRAIL RAILROAD BETWEEN
HOLES AND OWL CREEK
20,000
0
4
8
12
16
20
24
28
32
DAMAGE IN $100,000
720
722
730
ELEVATION IN FEET
PONDING AREA



MIAMI RIVER BASIN

REACH HC-1
LEFT BANK PONDING

HOLES CREEK

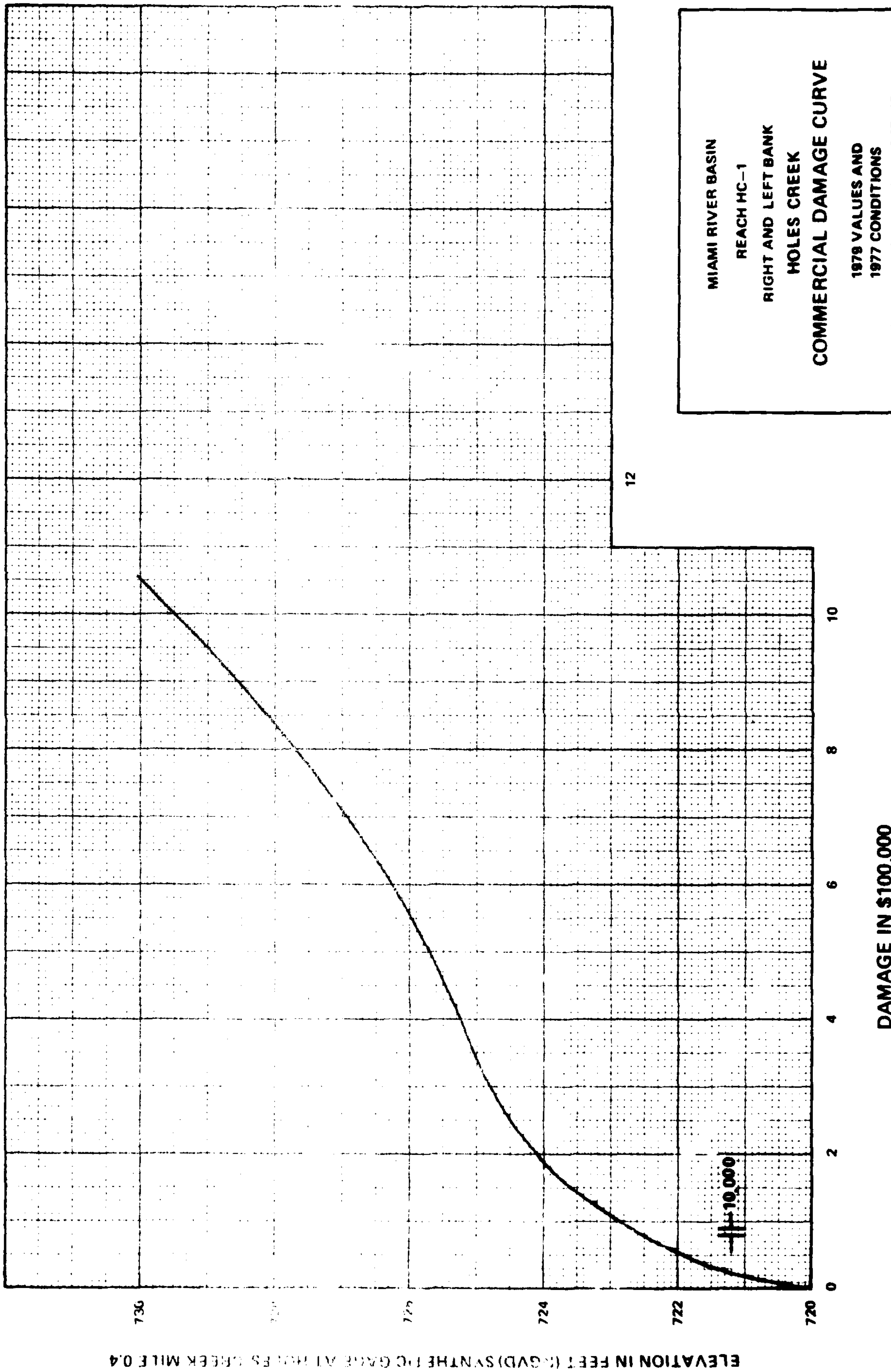
PUBLIC DAMAGE CURVE

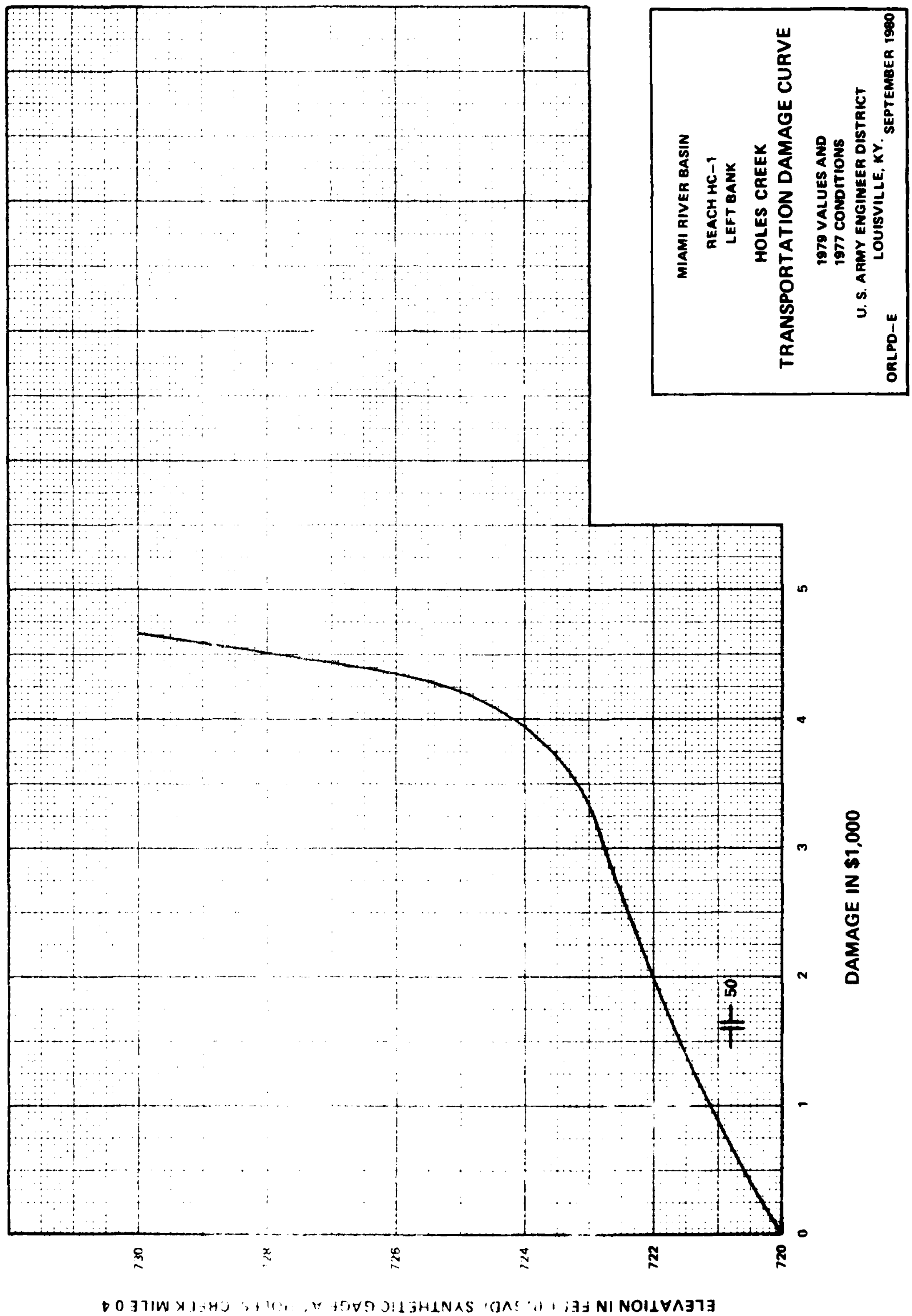
1979 VALUES AND
1977 CONDITIONS

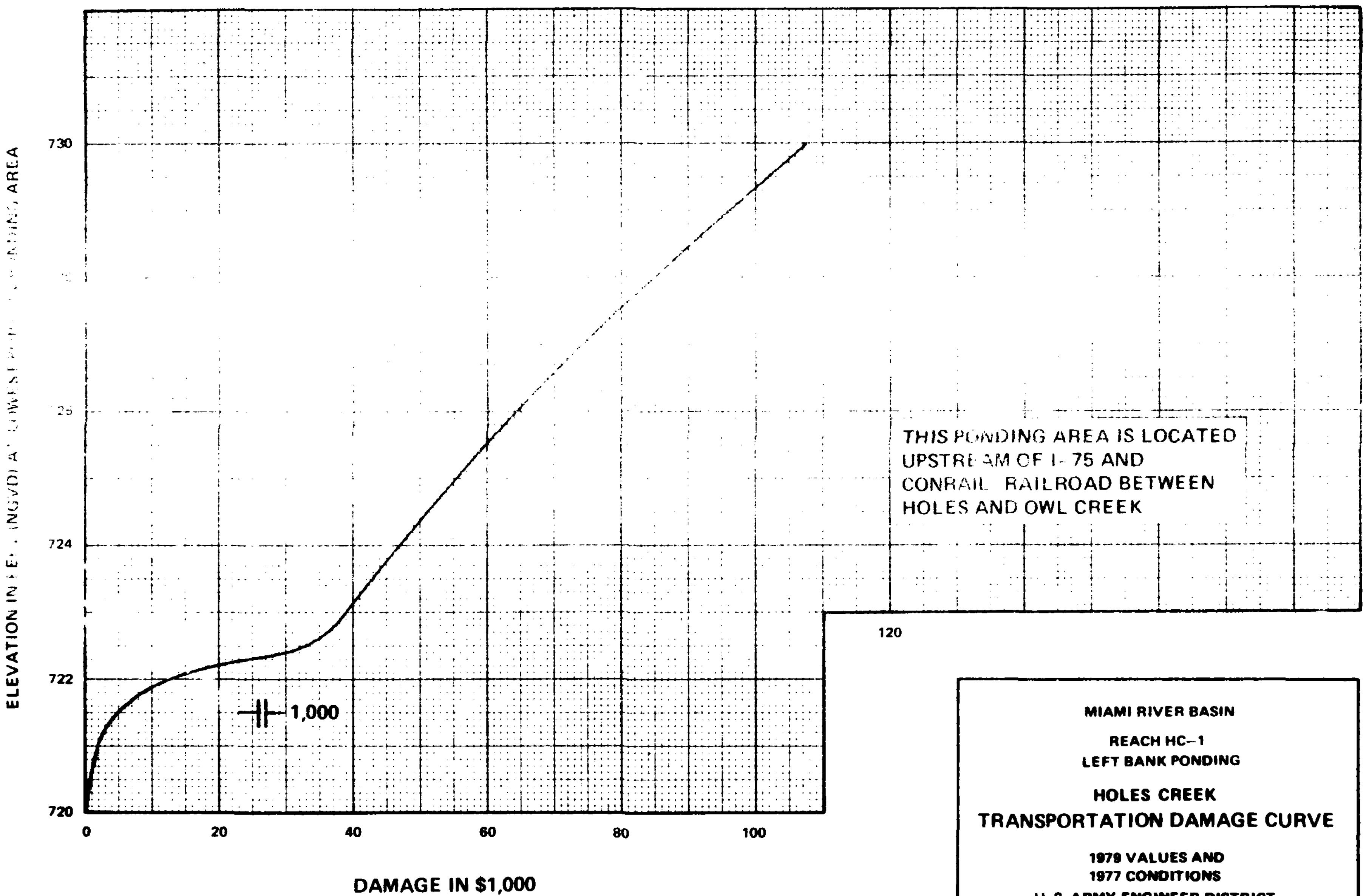
U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD-E SEPTEMBER 1980

MIAMI RIVER BASIN
REACH HC–1
RIGHT AND LEFT BANK
HOLES CREEK
COMMERCIAL DAMAGE CURVE
1979 VALUES AND
1977 CONDITIONS
U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.
ORLPD–E SEPTEMBER 1980




MIAMI RIVER BASIN
REACH HC-1
LEFT BANK
HOLES CREEK
TRANSPORTATION DAMAGE CURVE
1979 VALUES AND
1977 CONDITIONS
U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLPD-E
SEPTEMBER 1980
DAMAGE IN $1,000
0
1
2
3
4
5
720
722
724
726
730
50
ELEVATION IN FEET

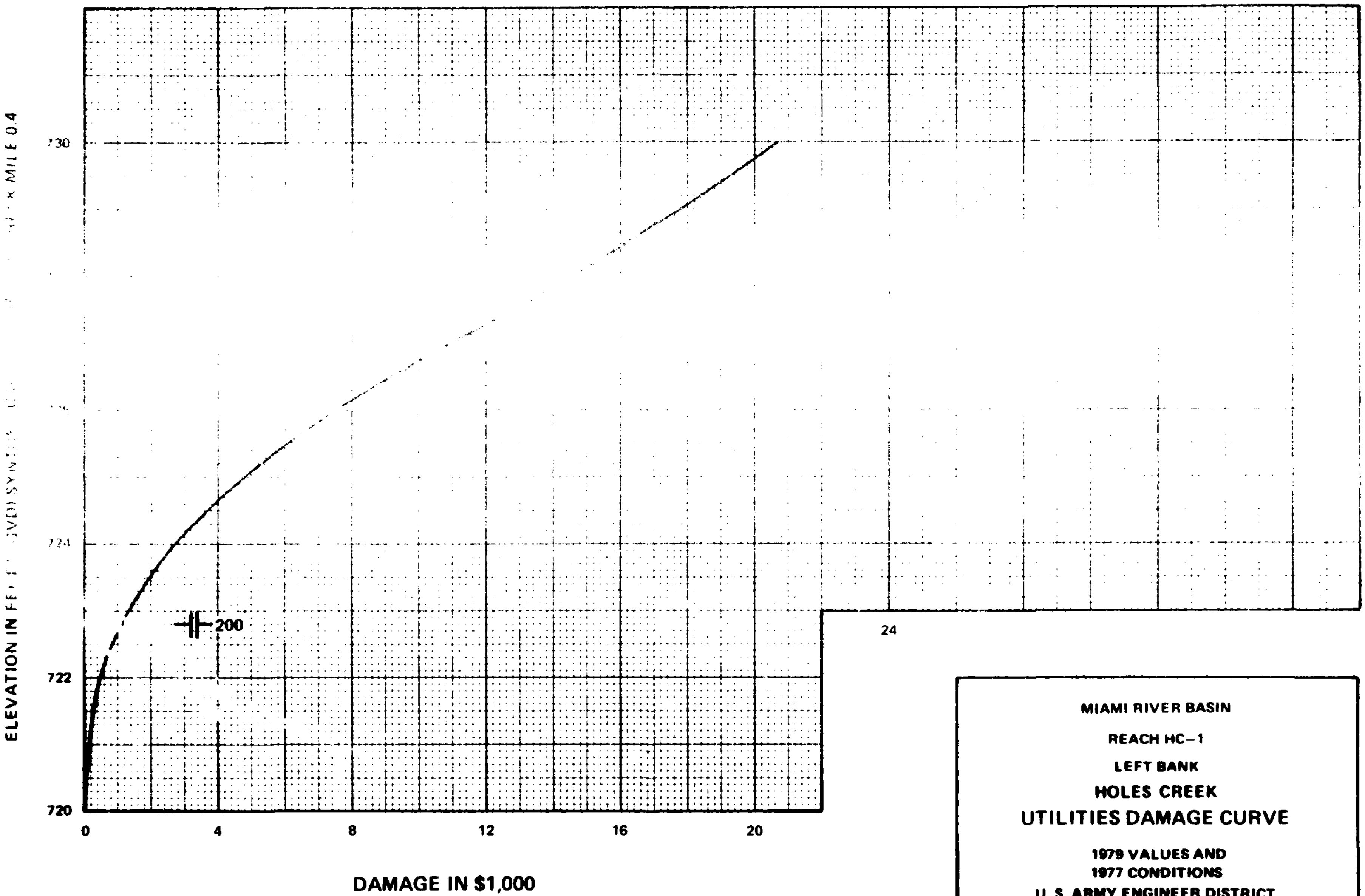


MIAMI RIVER BASIN

REACH HC–1
LEFT BANK PONDING

HOLES CREEK
TRANSPORTATION DAMAGE CURVE

1979 VALUES AND
1977 CONDITIONS
U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLPD–E SEPTEMBER 1980



MIAMI RIVER BASIN

REACH HC–1

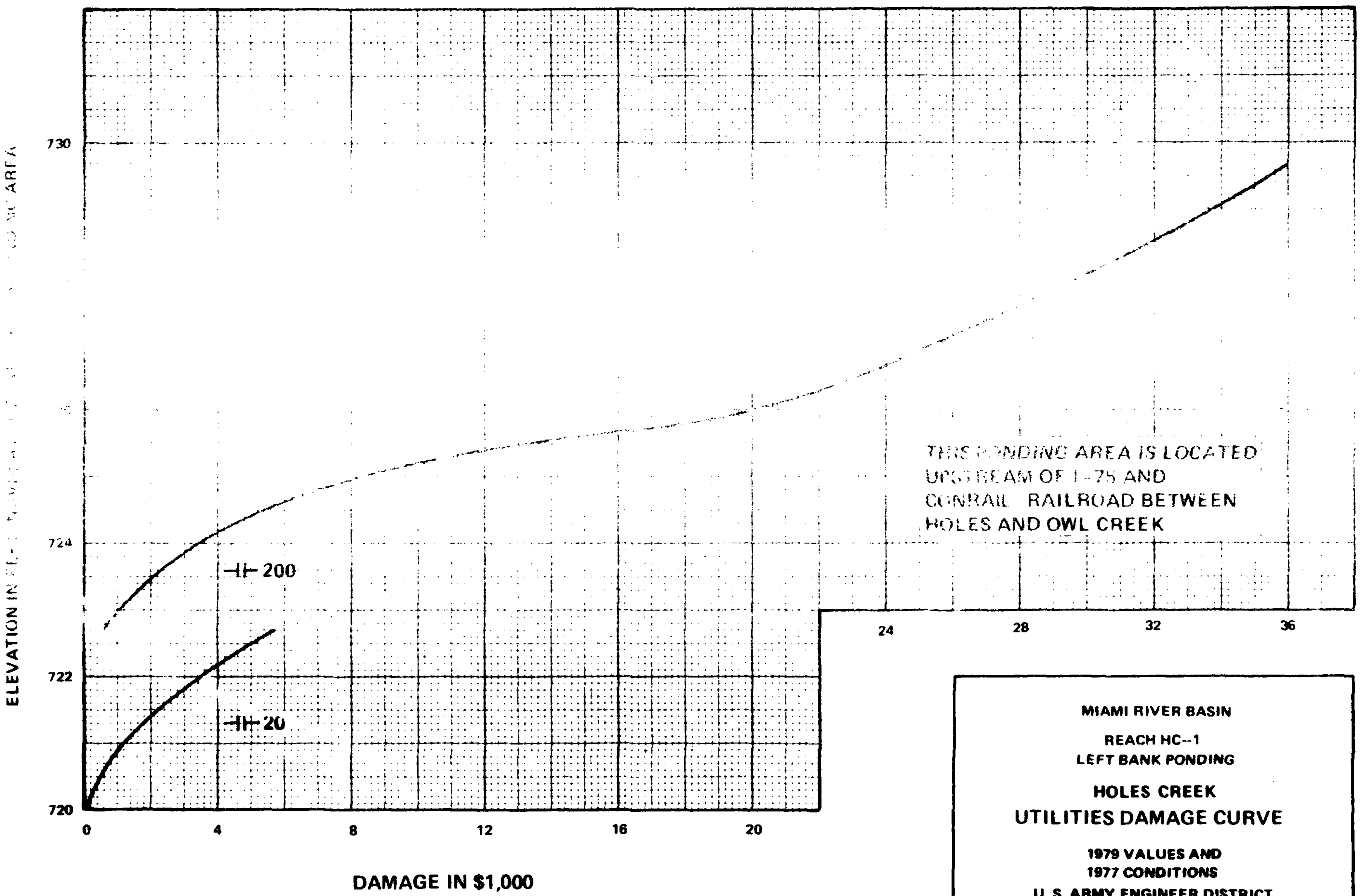
LEFT BANK

HOLES CREEK

UTILITIES DAMAGE CURVE

1979 VALUES AND
1977 CONDITIONS
U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY.

ORLPD–E SEPTEMBER 1980



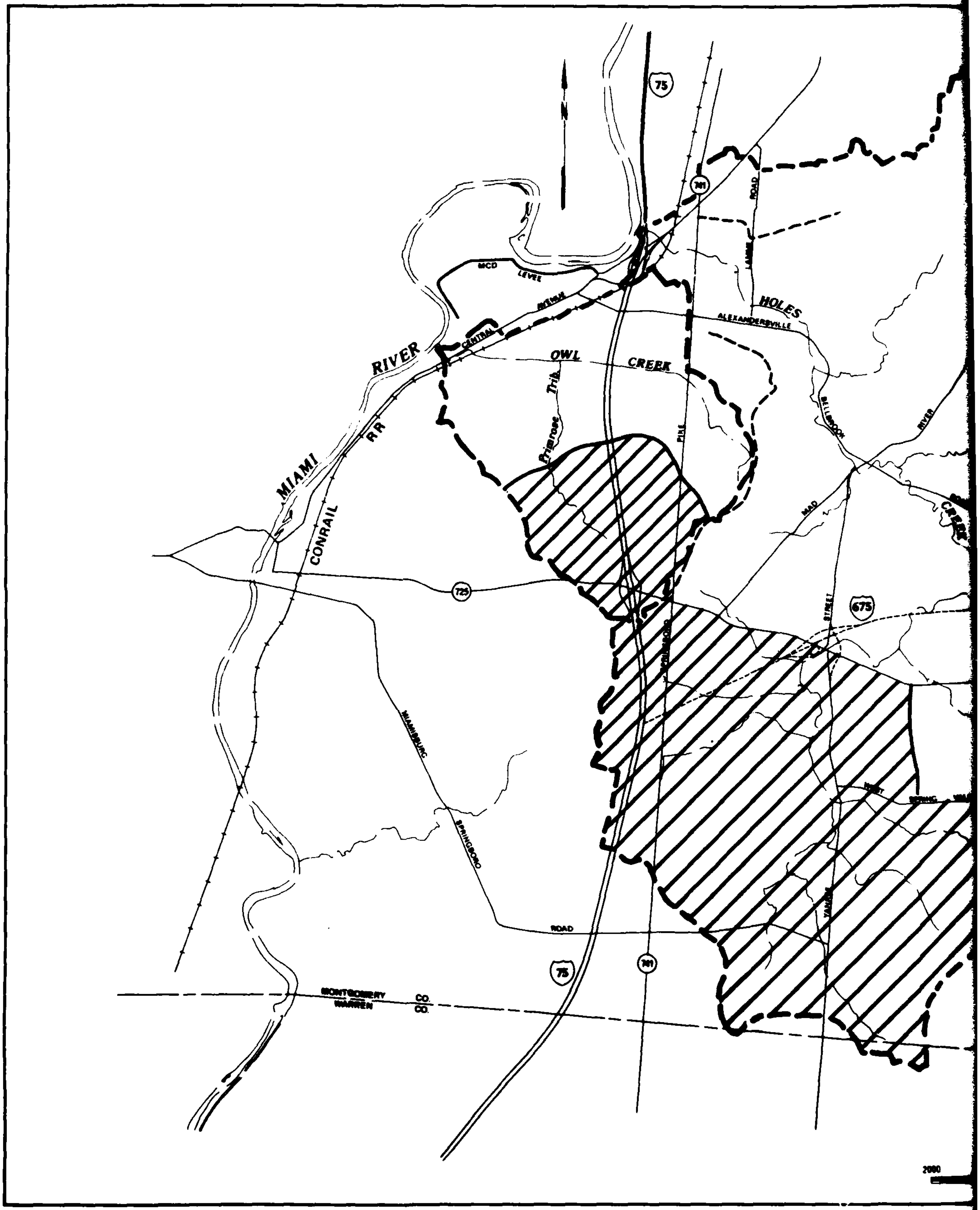
MIAMI RIVER BASIN

REACH HC–1
LEFT BANK PONDING

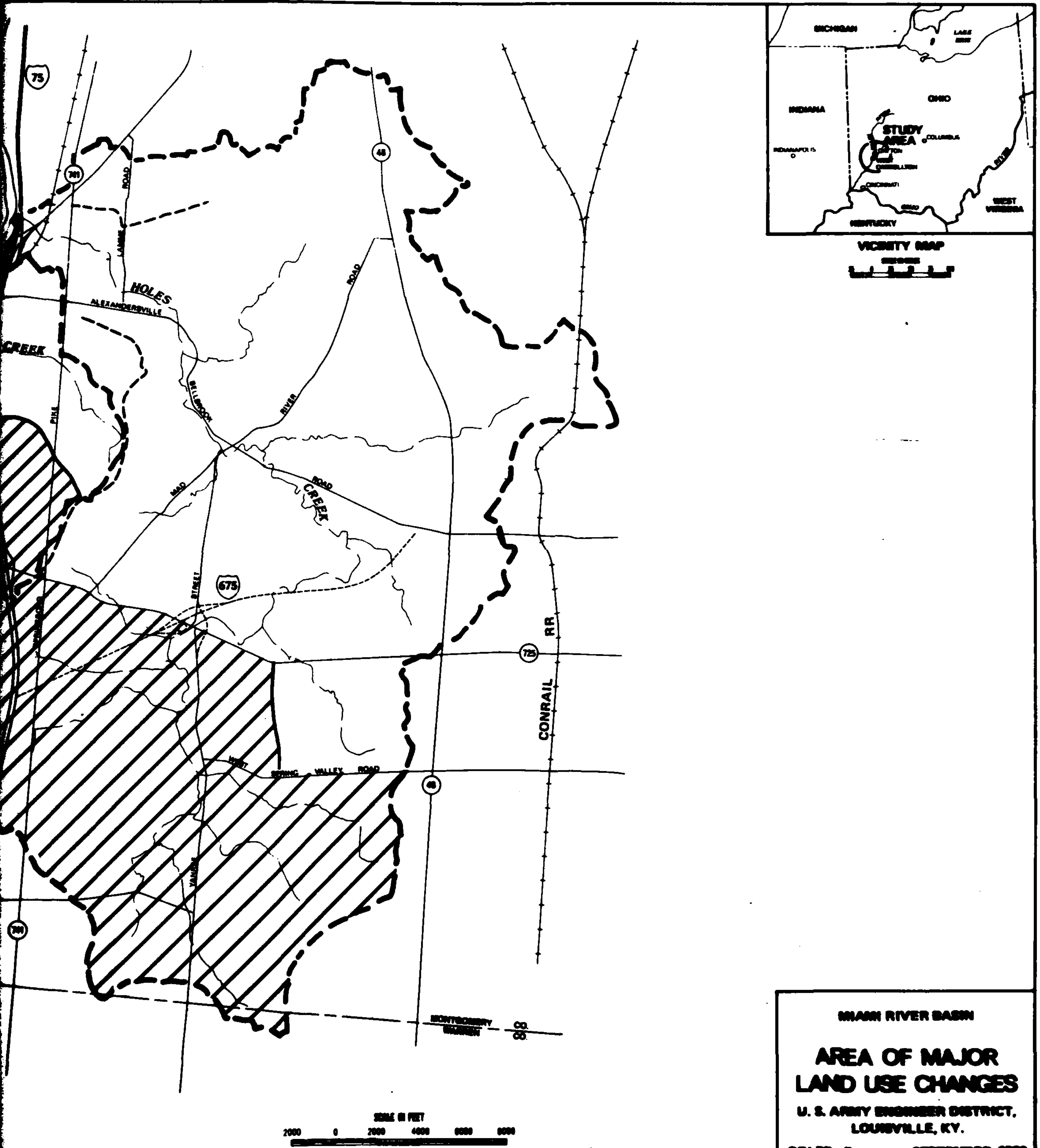
HOLES CREEK
UTILITIES DAMAGE CURVE

1979 VALUES AND
1977 CONDITIONS
U. S. ARMY ENGINEER DISTRICT
LOUISVILLE, KY.
ORLPD–E SEPTEMBER 1980

CORPS OF ENGINEERS



U. S. ARMY



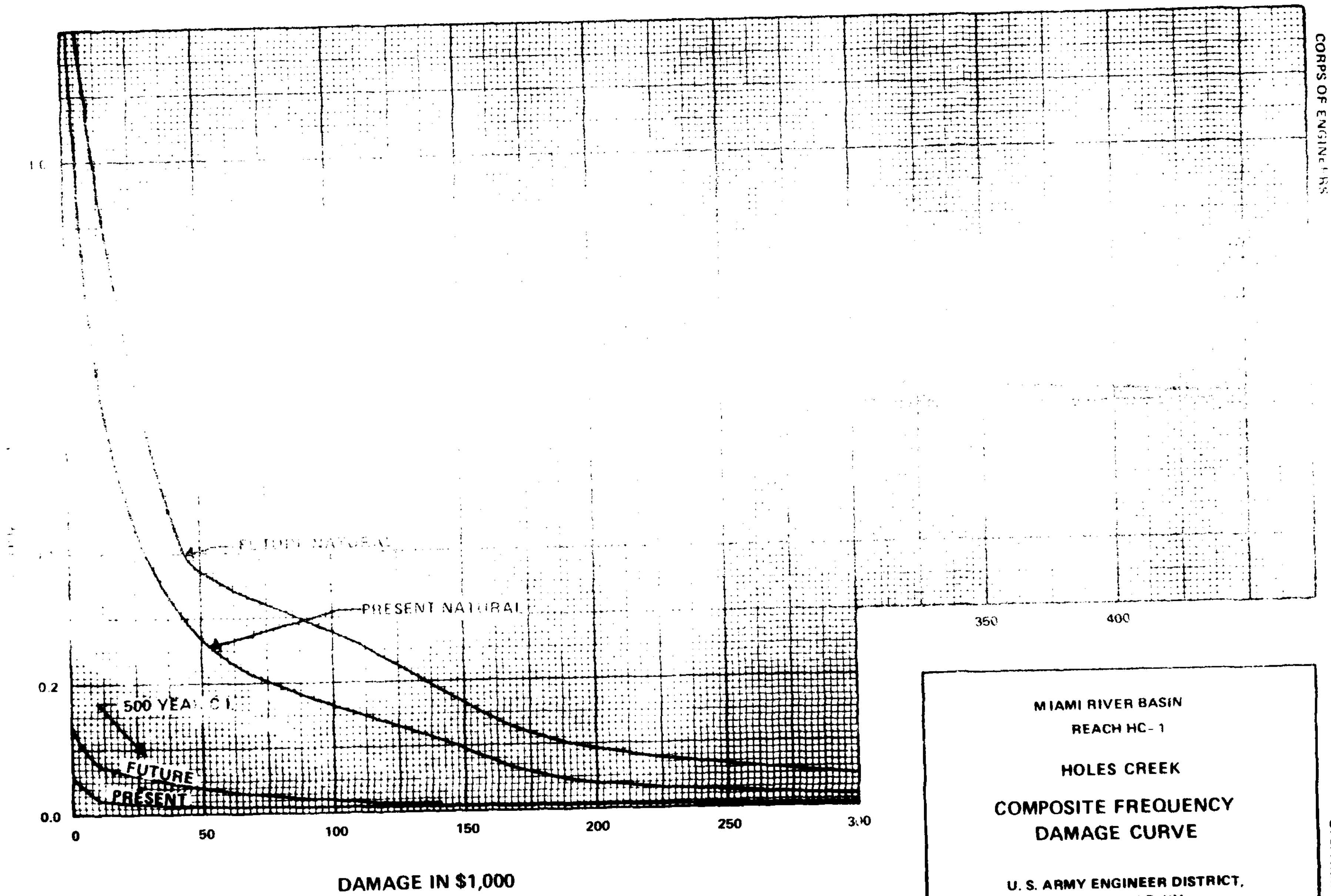
MIAMI RIVER BASIN

AREA OF MAJOR LAND USE CHANGES

U. S. ARMY ENGINEER DISTRICT, LOUISVILLE, KY.

ORLPD—E SEPTEMBER 1980

APPENDIX E PLATE E–10



U. S. ARMY

MIAMI RIVER BASIN
REACH HC-1

HOLES CREEK

COMPOSITE FREQUENCY
DAMAGE CURVE

U. S. ARMY ENGINEER DISTRICT,
LOUISVILLE, KY

ORLPD-E SEPTEMBER 1980

APPENDIX E ADDENDUM E-1

PROPERTY VALUES AND DEPTH-DAMAGE CURVE

The purpose of this addendum is to provide information as to how property values were estimated, the relationships between flooding depth and percent damage for various types of residential structures, and the derivation of damage curves.

With reference to derivation of property values, information on page E-22, Appendix E, indicated the area property values were estimated for existing development during surveys by the Louisville District Economics Branch in 1977 and 1978. Realtors were contacted and residential and business occupants were interviewed during the surveys. Information thus obtained and supplemented by experience of the surveyors was used as a basis of the property value estimates. Indices published by Engineering News Record (ENR) were used to update estimates to current values. Residential elevation and value data were related to depth-damage factors shown in the following table to develop elevation-residential damage curves. ENR updated damage curves were developed for other property categories from interview data gathered during the surveys for recurrence of various flood heights related to elevations of the properties.

As indicated on pages E-30 and E-32, values of expected future development were estimated on the basis of zoning requirements and development cost estimates provided by the real estate company referred to previously. Estimated future property values were related to the aforementioned depth-damage factors to develop future development elevation-damage curves. It should be noted that future flood plain development benefits credited to the recommended plan accounts for about 10 percent of the plan's total benefits.

RESIDENTIAL DAMAGE IN PERCENT OF VALUE

Depth in Feet	Percent Damage - 1 Story: Structure With and Without Base		Percent Damage - 1 Story: Contents With and Without Base		Percent Damage - 1-1/2 to 2 Stories: Structure With and Without Base		Percent Damage - 1-1/2 to 2 Stories: Contents With and Without Base		Percent Damage Mobile Homes: Real Property	Percent Damage Mobile Homes: Contents
21	44.0		80.0		57.0					
20	44.0		80.0		56.0		78.0			
19	44.0		80.0		55.0		78.0			
18	44.0		80.0		54 0		77.0			
17	44.0		80.0		53.0		75.0			
16	44.0		80.0		51.0		73.0			
15	44.0		80.0		49.0		70.0		95.0	83.0
14	44.0		80.0		47.0		66.0		95.0	83.0
13	44.0		80.0		44.0		61.0		95.0	83.0
12	43.0		80.0		41.0		57.0		95.0	83.0
11	42.0		80.0		36.0		53.0		95.0	83.0
10	41.0		80.0		33.0		51.0		95.0	83.0
9	40.0		80.0		31.0		49.0		92.0	83.0
8	39.0		80.0		30.0		47.0		88.0	83.0
7	37.0		78.0		29.0		46.0		83.0	82.0
6	35.0		76.0		28.0		45.0		76.0	78.0
5	33.0		72.0		26.0		42.0		65.0	73.0
4	30.0		66.0		24.0		38.0		52.0	67.0
3	27.0		56.0		22.0		34.0		38.0	57.0
2	24.0		45.0		18.0		27.0		25.0	37.0
1	19.0		35.0		14.0		18.0		13.0	17.0
EVEN 0	4.0	12.0	0	24.0	4.0	10.0	0	13 0	3.0	0
7	2.0	8.0		17.0	2.0	7.0		9.0	2.0	
6	0	7.0		12.0	0	6.0		6.0	0	
5		5.0		8.0		5.0		4.0		
4		4.0		6.0		4.0		3.0		
3		3.0		4.0		3.0		2.0		
2		2.0		2.0		2.0		2.0		
1		1.0		1.0		1.0		1.0		
0		0		0		0		0		
BASEMENT		BASEMENT		BASEMENT		BASEMENT		BASEMENT	FOUNDATION	

APPENDIX E ADDENDUM E-2

STRUCTURAL UNITS FOR SPECIFIC FLOOD EVENTS

The following table shows numbers of units subject to damages by recurrence of specific flood events based on existing natural conditions of flooding along Holes Creek.

Stream Reach and Property Category	Units Damaged by Specific Flood Events			
	500 Year	100 Year	25 Year	10 Year
Holes Creek				
HC-1				
Residential	102	78	56	38
Commercial	8	8	6	8
Public	-	-	-	-
Total	110	86	62	44
HC-1 (Left Bank Ponding)				
Residential	150	26	3	1
Commercial	-	-	-	-
Public	1	1	1	1
Total	151	27	4	2
HC-2				
Residential	211	196	181	157
Commercial	1	1	1	1
Public	-	-	-	-
Total	212	197	182	158
HC-3				
Residential	121	1	1	-
Commercial	-	-	-	-
Public	1	1	1	-
Total	122	2	2	-
HC-4				
Residential	6	4	3	2
Commercial	-	-	-	-
Public	-	-	-	-
Total	6	4	3	2
GRAND TOTAL	601	316	253	206

APPENDIX E ADDENDUM E-3
PROJECTED FLOOD PLAIN DEVELOPMENT

The purpose of this addendum is to provide additional information to support the prediction that lands shown as Sites 1 and 2 on Figure E-1 will be developed by 1985, irregardless of project construction.

Multiple unit apartment and commercial developments have recently been constructed adjacent to Sites 1 and 2, and residential construction in the area was underway at the time of the February 1979 investigation. During this investigation, planning officials of the Miami Township were interviewed and zoning maps were obtained. It was pointed out by these officials that residential and commercial buildings within the present natural 100-year flood plain were required to be flood proofed to prevent damage from floods of this magnitude. A method being used at the time consisted of constructing buildings on elevated concrete foundations above the 100-year flood level.

Attempts were made to contact the owners of Sites 1 and 2; personnel were referred to a local real estate company Discussions with representatives of this company indicated the sites likely would be largely developed (mostly for residential) within the next five or six years, regardless of project contruction.

Therefore, on the basis of the best information available, it is expected that residential development of the flood plain sites shown on Figure E-1 will occur by 1985, whereas extension of development into the undeveloped rural flood-free areas in the southern part of Montgomery County will not be developed before the turn of the century. This is expected because of the locational advantage of Sites 1 and 2 (technically location benefits are inappropriate). Infrastructure (roads, utilities, etc.) and amenities are in place or can be easily extended into these areas, whereas this is not the case in the flood-free rural areas. The cost of infrastructure extension into the rural areas would likely far exceed the cost of flood proofing in the flood plain sites.

APPENDIX E ADDENDUM E-4

ECONOMIC SENSITIVITY TO OCTOBER 80 AND FUTURE CONDITIONS

An economic summary of costs and benefits is shown in the following table based on October 1979 and 1980 price levels, 7-1/8 and 7-3/8 percent interest rates, and impacts future flood plain development, future affluence, and recreation have on economic justification of the recommended plan (Plan D).

ECONOMIC SUMMARY - PLAN D (RECOMMENDED)
HOLES CREEK, WEST CARROLLTON, OHIO

Item	Flood Control Benefits At 7-1/8 Percent	Flood Control Benefits At 7-3/8 Percent	Bridge Replacement Benefits At 7-1/8 Percent	Bridge Replacement Benefits At 7-3/8 Percent	FIA Benefits	Recreation Benefits	Total At 7-1/8 Percent	Total At 7-3/8 Percent
(1) Total Benefits	612	651	49	55	9	84	754	799
(2) Total Benefits without Future Flood Plain Development	552	587	49	55	9	84	694	735
(3) Total Benefits without Future Flood Plain Development and without Future Affluence	465	520	49	55	9	84	607	668
(4) Annual Charges								
Without Recreation							509	547
With Recreation							580	623
(5) Benefit-Cost Ratio Based on (1)								
Without Recreation							1.3	1.3
With Recreation							1.3	1.3
(6) Benefit-Cost Ratio Based on (2)								
Without Recreation							1.2	1.2
With Recreation							1.2	1.2
(7) Benefit-Cost Ratio Based on (3)								
Without Recreation							1.03	1.07
With Recreation							1.05	1.07

NOTE: All data is shown in $1,000. 7-1/8 percent data based on October 1979 price levels and 7-3/8 percent data based on October 1980 price levels. Price level and interest rate changes are considered to have insignificant impact on FIA and recreation benefits.

APPENDIX E ADDENDUM E-5

ECONOMIC SENSITIVITY TO URBANIZATION BY 1990

Recent field investigations indicate that undeveloped areas in the Holes Creek drainage area may be developing for urban use at a faster rate than the predicted year 2000. The following table shows net benefits and benefit to cost ratios assuming urbanization of the Holes Creek flood plain by year 1990.

ECONOMIC SUMMARY
SELECTED PLAN

Purpose	Total First Cost	Average Annual Cost	Average Annual Benefits	Net Benefits	Benefit to Cost Ratio
Flood Control 1/	$6,430,000	$509,000	$693,000	$184,000	1.4
Recreation	600,000	71,000	84,000	13,000	1.2
Selected Plan	$7,030,000	$580,000	$777,000	$197,000	1.3

1/ Includes bridge replacement and flood insurance administration benefits

APPENDIX F

PRELIMINARY SECTION 404 EVALUATION

Preliminary Section 404 Evaluation

CONSIDERED FLOOD CONTROL ALTERNATIVES FOR

HOLES CREEK NEAR WEST CARROLLTON, OHIO

Section 301 of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA) provides that the discharge of dredged or fill material into a navigable waterway be permitted at specific disposal sites by the Secretary of the Army acting through the Chief of Engineers under Section 404(a). Section 404(b) requires that each disposal site shall be specified by application of guidelines developed by the Administrator of the Environmental Protection Agency in conjunction with the Secretary of the Army. The requirements for the review of dredged material associated with a Federal project are prescribed in final regulations (33 CFR 209.145) dated 22 July 1974 concerning the policies, practices, and procedures to be followed by all Corps of Engineers installations in assessing Federal projects. These regulations were developed pursuant to Sections 313 and 404 of the FWPCA and Section 102(e) of the Marine Protection Research and Sanctuaries Act of 1972. The discharge of dredged or fill material into navigable waters must also be in accordance with final regulations published in Federal Register, Volume 42, No. 138 - Tuesday, 19 July 1977, which govern the issuance of Department of the Army permits for activities that occur in waters of the United States. A Corps project involving the discharge of dredged or fill material [illegible] waters of the United States must be evaluated in accordance with in[illegible]rim f[illegible] [illegible]delines outlined in Federal Register, Volume 40, No. 193 - Friday, 5 September 1975 (40 CFR 230). These guidelines were developed by the Administrator, Environmental Protection Agency (EPA), in conjunction with the Secretary of the Army pursuant to Section 404(b) of the FWPCA. Construction of the considered Holes Creek flood control alternatives will require the discharge of dredged or fill material into the creek and, therefore, an evaluation pursuant to Section 404(b) of the FWPCA is required.

1.0 CONSTRUCTION ACTIVITIES WHICH WOULD INVOLVE THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO THE WATERCOURSE

All considered flood damage prevention structural plans for Holes Creek will involve the discharge of dredged or fill material into the waterway, specifically for those areas where channel realignment is being considered. The channel improvement plans, which would provide 25-year or 500-year degree of protection for the lower reach of the creek, essentially involves widening (from 60 to 200 feet at bottom) of the stream. Spoils material will require disposal in a potential site located (as a first choice) within nearby gravel pits, yet some of the estimated 60,000 cubic yards of spoil for the 25-year channel and 154,000 cubic yards of spoil for the 500-year channel will be placed in the old creek channel.

Similarly, with the right bank levee plan, about 55,000 cubic yards of earthen material needed for levee construction would be borrowed and the old channel where realigned would be backfilled. The considered location for excavation of this borrow material is the nursery property or adjacent and east of Conrail Railroad.

The dredged and fill material is expected to be principally silty-loam, sand, and gravel characteristic of the vicinity soils, except for the limestone riprap and concrete used for reducing channel erosion.

2.0 PHYSICAL EFFECTS.

Physical effects to aquatic ecology from discharge of dredged or fill material to the stream will result from any of the considered alternatives. Impacts to the water column and benthic community will be greater for the channel improvement plans than for the alternative levee plan. This is naturally due to greater stream disturbance. Impacts from the plans will occur as localized temporary increases in suspended solids and subsequent turbidity within the water column.

Other physical effects may include changes in bottom geometry and substrate composition that cause subsequent alterations in water circulation, salinity gradients, and the exchange of constituents between sediments and overlying water with subsequent alterations of biological communities.

3.0 CHEMICAL-BIOLOGICAL INTERACTIVE EFFECTS.

Chemical-biological impacts involve contaminants present within the dredged or fill material. The principal concern from open water discharge of any dredged material containing chemical contaminants is the potential effects to the water column and/or benthic communities. No problems of this sort are expected. Composition of the material is silty-loam, sand and gravel which is natural to the area. The imported riprap and concrete should present no significant effects.

4.0 COMPARISON OF SITES.

The dredged or fill material will not cause any adverse effects to the environment since most of these materials will be obtained from within the immediate project vicinity and the imported materials will be from pollution free sources.

5.0 WATER QUALITY CONSIDERATIONS.

No long-term adverse impact to water qual' ɩs expected to result from the considered alternatives. Short-te[illegible] turbi[illegible] [illegible]d siltation will occur during construction. Construction practices and/or contract requirements will reduce these impacts.

6.0 SELECTION OF DISPOSAL SITES AND CONDITIONING OF DISCHARGES OF DREDGED OR FILL MATERIAL.

Justification for disposal of these materials from constructing the considered alternatives lies in the purpose for flood damage prevention. Disposal site selection is based on engineering feasibility and net benefits to be gained. The following objectives, established by EPA Guidelines [40 CFR 230.5(a)], are considered in making a determination on a considered discharge:

(1) Avoid discharge activities that significantly disrupt the chemical, physical, and biological integrity of the aquatic ecosystem of which aquatic biota, and substrate, and the normal fluctuation of water level are integral components;

(2) Avoid discharge activities that significantly disrupt the food chain, including alterations or decrease in diversity of plant and animal species;

(3) Avoid discharge activities that inhibit the movement of fauna, especially their movement into and out of feeding, spawning, breeding, and nursery areas;

(4) Avoid discharge activities that will destroy wetland areas having significant functions in maintenance of water quality;

(5) Recognize that discharge activities might destroy or isolate areas that serve the function of retaining natural high waters or flood waters;

(6) Minimize, where practicable, adverse turbidity levels resulting from the discharge of material;

(7) Minimize discharge activities that will degrade aesthetic, recreational, and economic values;

(8) Avoid degradation of water quality.

Regarding these objectives, much of this has already been discussed within the main text of this report. Impacts associated with placement of fill or dredged material for the purposes of new channel construction will be local and short-term. Impacts will be greater for the channel improvement plans than for the levee plan since more surface area will be disturbed by the former. Nevertheless, for each alternative, proper construction methods and practices will minimize these impacts.

The degradation of water uses at the intended disposal sites need also be considered. The following relate to impacts which would directly result from dredged or fill material disposal (during channel construction) into the waterway:

(1) Municipal Water Supply Intake: Community well fields near the study area will not be affected by any of the considered plans. However, two wells and pumps used for irrigation and owned by Siebenthaler Nursery will be modified by the channel improvement alternatives. Water mains within the area will need to be relocated.

(2) Shellfish: Populations of shellfish within the creek will be disturbed from construction of either plan and to a greater extent by the channel improvement plan since more surface area will be disturbed. However, there are no commercially significant shellfish populations in the area.

(3) Fisheries: Within the pertinent stream areas, these resources will be affected. Sediment burial and disturbance of habitat will affect spawning habitats and potential migration during construction.

(4) Wildlife: No long-term adverse impact to wildlife is anticipated to result from fill or dredged material discharge.

(5) Recreation Activities: Project construction may encourage further development of this area for new recreation facilities as proposed under the Dayton Strip and Node Corridor, and Germantown Primitive Corridor plans. These programs have the potential to enhance and preserve open space lands for new water- and nonwater-related recreation.

(6) Threatened and Endangered Species: No threatened and endangered species are known to exist within the study area. Similarly, no critical habitats are noted for the area. Material discharge from construction is not anticipated to have any effect.

(7) Benthic Life: Benthic species will be impacted by construction, with the greater effect from the channel improvement alternative. The levee plan will involve disruption of 1,500 feet of channel area.

(8) Wetlands: Not applicable.

(9) Submersed Vegetation: No aquatic flora of significant biological productivity will be affected.

(10) Size of Disposal Site: Alternative sites consisting of gravel pits have been considered for dredged material disposal (channel improvement plans). The activity is for construction and the site size and actual location will be dictated by engineering requirements.

Harmful effects to aquatic systems from disposal will be minimized by proper construction techniques or practices. Also, if necessary, dredged material (channel improvement plans) could be covered and the ground water in the area monitored for contamination. This dredged material, though, is not anticipated to pose any problem.

CONCLUSION

The Environmental Protection Agency 404(b) Guidelines (40 CFR 230) have been applied to those aspects of the project involving the discharge of dredged or fill material into waters of the United States. The eight objectives established by EPA to minimize effects on water quality and the aquatic ecosystem have been evaluated as part of this report whereby effort can further be performed in accordance with these conditions.

DETERMINATION

A review of the considered actions in accordance with Section 404(b) Guidelines allows the following determinations:

(1) An ecological evaluation has been made following the evaluation guidance in 40 CFR 230.4, in conjunction with the evaluation considerations in 40 CFR 230.5.

(2) Appropriate measures have been identified and incorporated within the considerations to minimize adverse effects on the aquatic environment as a result of the discharges.

(3) Consideration has been given to the need for the activities, the availability of alternate sites, and methods of disposal that are less damaging to the environment and such water quality standards as are appropriate and applicable by law.

(4) The proposed discharges will not affect wetlands.

FINDINGS

Considering the foregoing evaluation, and in view of the above determinations, it is found that the discharge sites for the Holes Creek project have been specified through application of the 404(b) Guidelines.